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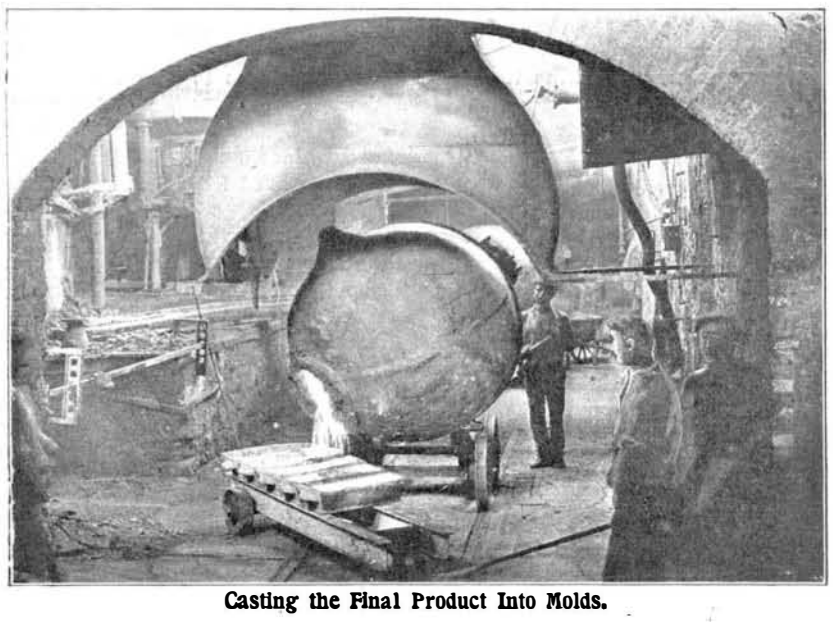
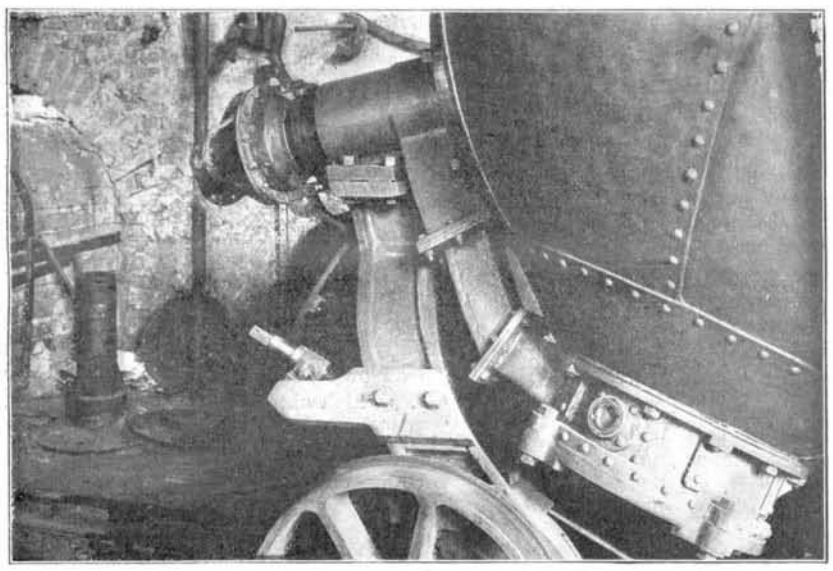
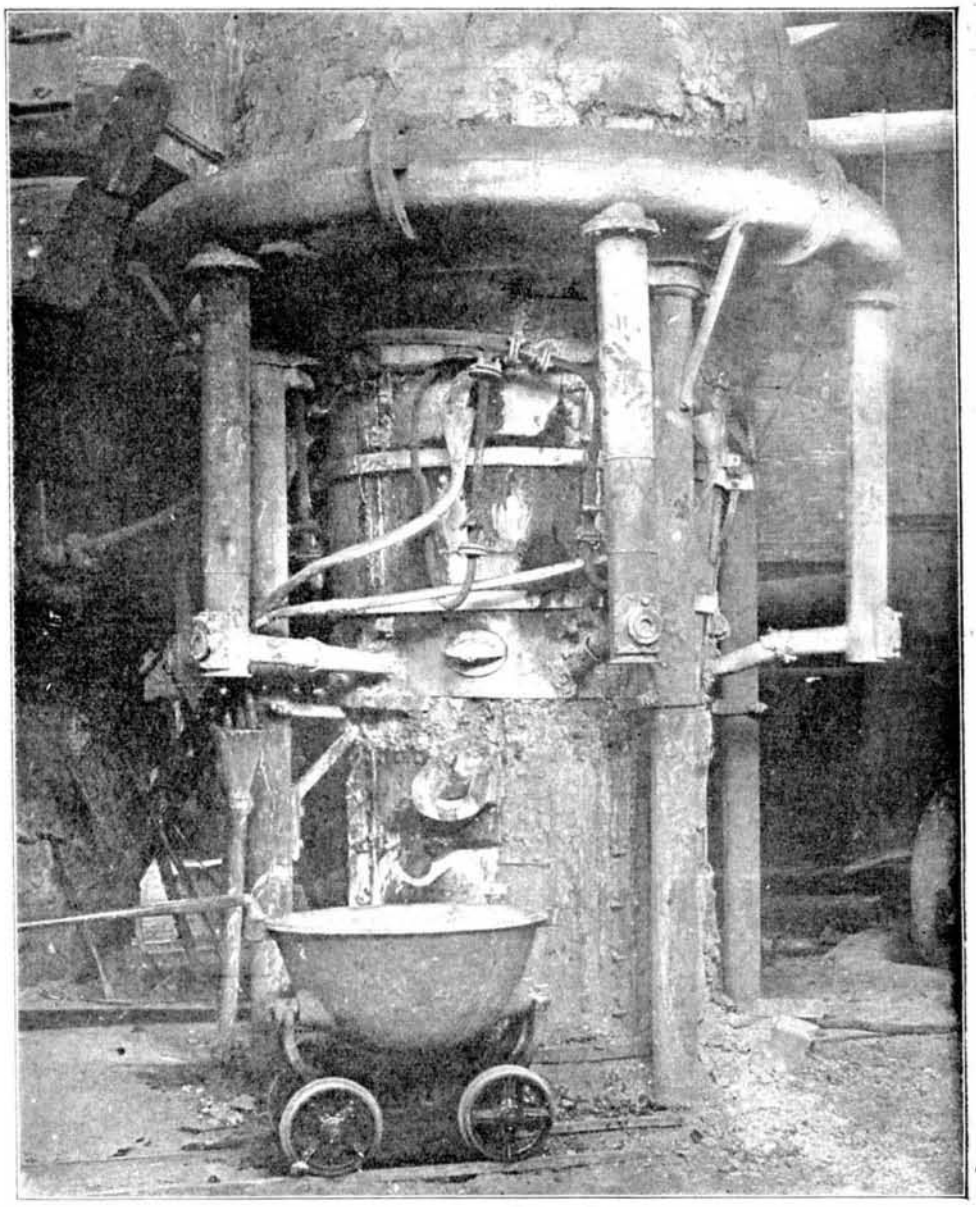


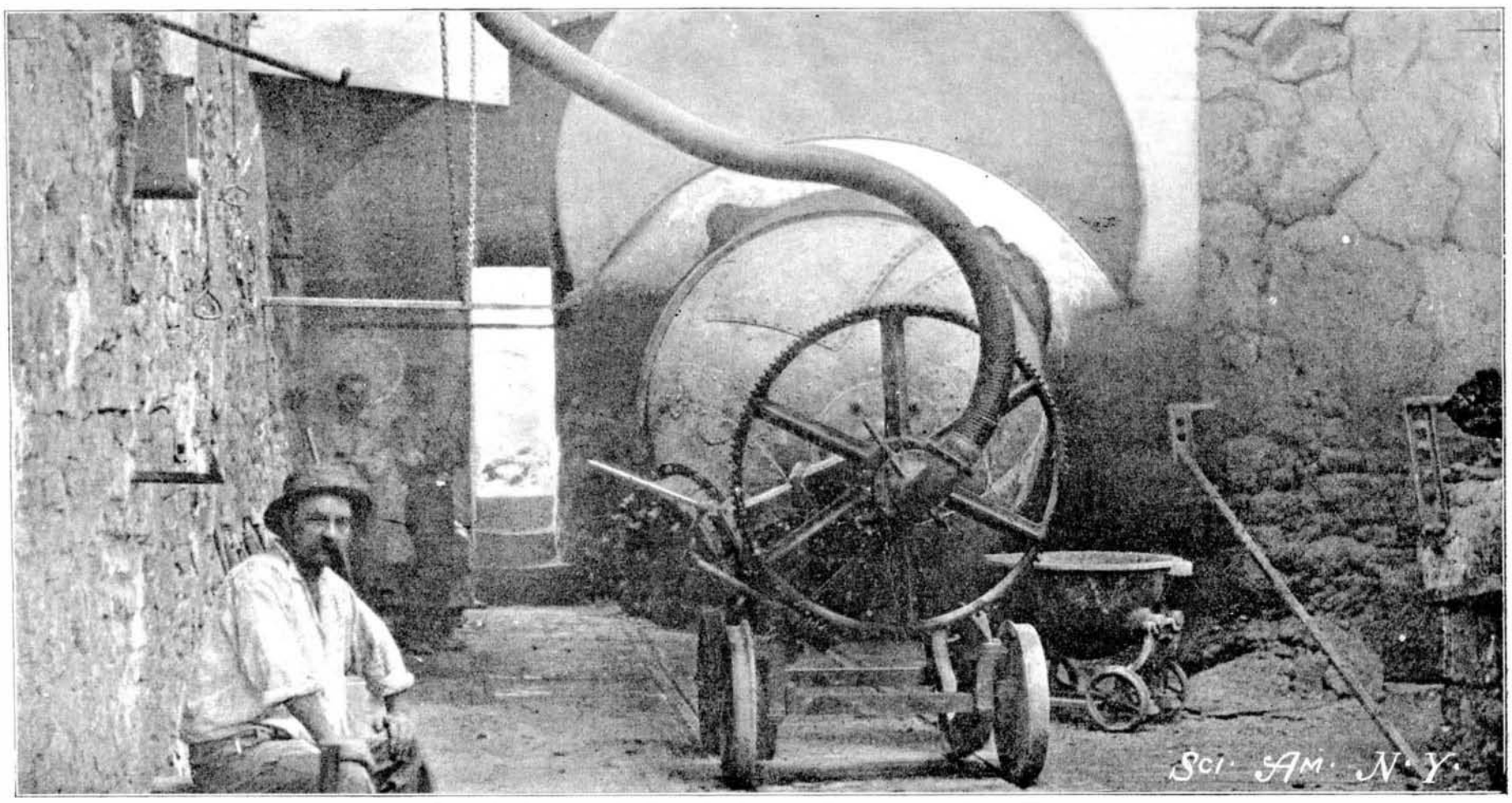
Casting the Final Product Into Molds.



Details of Converter Air Tube and Chest.



A Water-Jacket Furnace.



The First Blow, During Which Partial Removal of Iron and Sulphur Occurs.

THE BESSEMER COPPER PROCESS.—[See page 218.]

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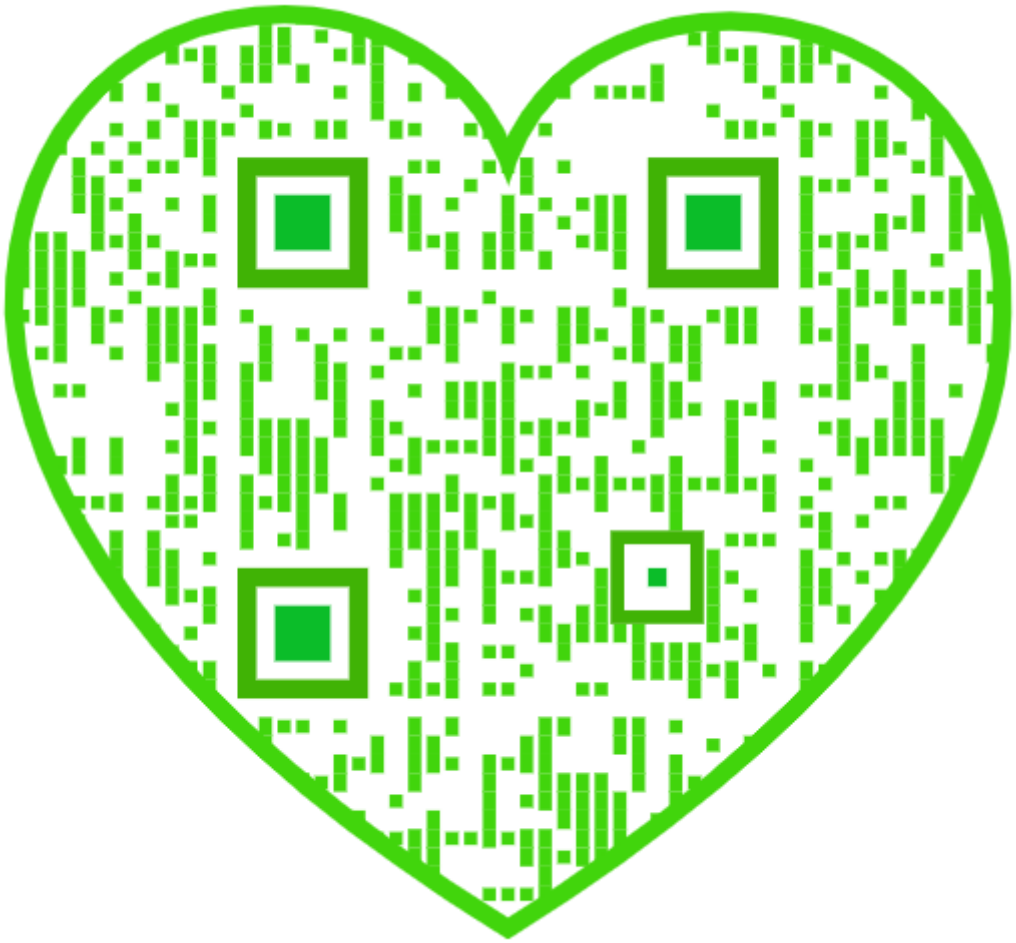

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ESTABLISHED 1845

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NEW YORK, SATURDAY, SEPTEMBER 26, 1903.

The editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

LIFE IS LONGER UNDER MODERN CONDITIONS

At a recent session of the International Congress of Actuaries, held in this city, the comforting fact was brought out that the improved conditions of modern life, as shown by statistics of the insurance companies extending over half a century, have resulted in a decided increase of the length of life of the average individual. The actuaries are men of the very highest professional ability and their conclusions are based, not upon limited observation, as is so often the case where important deductions are drawn from statistics, but upon a vast accumulation of insurance data and upon a careful analysis of the census. Hence their conclusions may be accepted as perfectly reliable and accurate. Mr. C. L. Landre, of Amsterdam, in speaking of the results obtained in his country, stated that it was remarkable how very constantly the insurance statistics show the expectation of life is increasing, the increase of the maximum of the expectation of life having risen from 46.1 to 56.4 years for men and 48.6 to 57.8 years for women. Mr. C. G. Warner stated that the results obtained in Great Britain show that whereas in 1838 the annual rate of mortality of men for all ages was twenty-three per thousand, in 1900 it had fallen to nineteen per thousand; while for women it had fallen in the same period from twenty-two to seventeen per thousand. The same authority stated that the distinct decrease in mortality as the nineteenth century progressed was so symmetrical as to indicate a settled and permanent tendency. The curious fact was brought out that the most marked improvement is shown in the early years of life. From four years of age up to thirty-four the improvement is so steady that it must be regarded as the direct result of law, while the same fact holds true of female mortality for a decade longer, or up to the age of forty-four, and in a less decided degree for the male. After this age there are periods through which the ratios are at about the same level, and in the later epochs of life there is an evidence of retrogression. During the first years of the great national prosperity that marks the nineteenth century, the effect in the lengthening of life was not marked, for prosperity was "not a little heartless." But in later years humanity and philanthropy had left their mark in the growth of hospitals and organizations for the care of the poor and suffering, while contemporaneously there was a great advance in hygiene and surgery, which also helped to extend the period of life. These developments have acted with more marked beneficial effect on childhood and youth than they have upon middle age; for in the later periods the intenser strain and keener competition which characterize modern life, its higher pressure, and special forms of diseases, are causes of mortality from which the earlier periods of life are exempt.

ELEVATED AND TROLLEY TRACKS ON THE NEW BRIDGES.

The bridge commissioner has recently submitted to the mayor of this city a comprehensive plan for connecting the new bridges over the East River with the surface and elevated roads in Manhattan and Brooklyn. The subject is of such vital importance to Greater New York, and indirectly, as an object lesson in transportation, to the country at large, that we present herewith a brief digest of the commissioner's suggestions.

In the first place it is recommended that the Brooklyn Bridge be strengthened and double-decked, the present elevated and bridge cars being carried on the upper deck and the trolley cars removed from the roadway and run upon the lower deck between the trusses. This would facilitate trolley traffic, and the general vehicular traffic would have the roadways entirely to itself. The trolley tracks will expand into ten loops beneath the new station, which is to be built at the City Hall. The elevated trains also will travel around a loop at the new City Hall station and return over the same bridge to Brooklyn, there connecting with the Fulton Street and Flatbush and Myrtle Avenue elevated tracks.

The new Manhattan Bridge adjoining the Brooklyn Bridge will be utilized by carrying the Flatbush Avenue railroad across the structure to Manhattan. This line will pass over the Second, Third, Sixth, and Ninth Avenue elevated railroads to the North River, thus tapping these north and south lines and putting them in through communication with Long Island, while the Fulton Street elevated railroad will cross by the same bridge, and in Manhattan its tracks will be carried upon an upper deck, above the present elevated structure, through Chatham Square and down Park Row to the proposed City Hall station. This last-named railroad will thus provide a complete loop from Fulton Street over the Manhattan Bridge, back to the Brooklyn Bridge to Brooklyn. Similar trolley and elevated connections are suggested by way of the new Williamsburg Bridge, commonly known as the New East River Bridge, and the commissioner also advocates the installing of the moving-platform scheme which is now under consideration by the rapid transit commissioners. This platform will extend from Williamsburg over the bridge to Manhattan, and in a subway below Delancey Street to the Bowery, then under the Bowery, Park Row and Nassau Street to the Battery. The platform would have a capacity of 70,000 passengers an hour. The elevated railroad tracks on Blackwell's Island Bridge will be connected in Manhattan with the Second Avenue elevated system, while on Long Island connections will be made with the elevated railroads at Thompson or Jackson Avenue.

STEAM TURBINE FOR OCEAN LINERS.

It is persistently rumored that the Cunard Steamship Company has under serious consideration the question of installing turbines in place of the customary reciprocating engines on the two great steamships which it is about to build for the Atlantic service. Our readers will remember that when the question of the construction of these two vessels, which will greatly exceed all existing steamships in size, power, and speed, was finally determined upon, we expressed the conviction that the time was ripe for the introduction of the steam turbine into the Atlantic service, and that there was every reason why this new type of motor should be adopted for these ships. Naturally, before venturing upon so momentous a change, the company will wish that they had for their guidance more extended records of the behavior of the marine turbine, particularly on vessels of some intermediate size between the existing turbine channel passenger steamers and the giant vessels which they are themselves about to build. If the Cunard Company should determine to use the turbine, they will have acted with a great deal of courage and much commendable enterprise; but for our own part, we feel satisfied that the time is ripe for such a venture. The success of the turbine from its first installation in the little "Turbinia" up to the large and fast channel steamer "Queen," has been so pronounced and uninterrupted, that one fails to conceive of any complications which might develop, were the turbine employed on ocean liners, that would prevent the same excellent results from being secured. Indeed, the presumption is rather the other way, for the larger the ship, the better has been the performance; and, indeed, we have the oft-reiterated statement of Mr. Parsons that the greater size of the turbines that would have to be installed in ocean liners would tend toward better results in speed, power, and economy. A strong presumption as to the practicability of using turbine units of great horse power successfully on steamships is found in the fact that the units of 2,000 horse power or more that have been built for electric lighting and power plants have given such excellent service, and the electrical companies are so well satisfied with the results, that they are not hesitating to build units of as high as 10,000 maximum horse power. Now there is no reason why the engine room of a transatlantic liner should present any obstacles to the successful employment of the high-powered turbine any more than it has to the use of the high-powered reciprocating engine. Indeed, the presumption is the other way; for the racing of the propellers, which is liable to have serious results in the reciprocating engine, could, in the nature of things, do but little harm to the perfectly-balanced parts of a large turbine.

MERCHANTS' ASSOCIATION ON CITY TRANSIT.

We have before us one of those voluminous and most carefully compiled reports which are issued from time to time by the Merchants' Association of this city, on questions affecting the municipal welfare of New York. While we have not on every occasion been able to agree with the suggestions of the Merchants' Association, the exceptions have been rare, and in the report before us, which deals with the question of passenger transportation service in the city of New York, the Association has covered the ground most thoroughly and, as a result of its investigations, has drawn up a series of suggestions which, in the main, we heartily indorse.

Reference is made to the public indignation which was aroused last winter by the disregard of public rights shown by the surface and elevated railroad companies of this city. It will be remembered that after public hearings by the State Railroad Commission, a report was filed in which was set forth what might be done to improve existing conditions. After the expiration of the greater part of a year, the Merchants' Association states that the orders of the Commission, as a result of their investigation last winter, although ostensibly complied with by the companies, have not in reality been given such effect as to afford any substantial relief. Moreover, the Railroad Commission has made no serious attempt to enforce its orders, and, indeed, the legal committee of the Merchants' Association has shown that the Commission lacks the necessary legal powers to do so.

After making a thorough examination of the street car systems of Boston, St. Louis, Philadelphia, and other cities, the expert engineers employed by the Merchants' Association have offered the following conclusions and recommendations:

That more cars be put in service during the rush hours, the Committee being satisfied that the number of cars now operated might be increased considerably, even in the busiest hours.

That immediate measures be taken to reduce to the minimum the obstruction to the movement of trolley cars that could be handled, were this done, would be trucks, by building operations, and by other preventable obstructions. It is believed that the number of cars that could be handled, were this done, would be increased fully twenty per cent.

That measures be taken to substitute on all the congested lines cars with a seating capacity of fifty-two passengers each; the present seating capacity of the closed cars on Broadway being thirty on the average.

That a fair trial be given to double-decked cars. This is a suggestion which the SCIENTIFIC AMERICAN made several years ago, and we are still of the opinion that the double-decked car, with ample means for ingress and egress, because of the large number of passengers carried would do more than anything else to relieve congestion in the busiest hours.

The above are the most important recommendations of the report, but it is also suggested that at the principal transfer stations the cars be stopped in sets of two or more; that two motormen be stationed on all cars 28 feet long, or longer, at least during the rush hours of any congested lines, the cars being stopped to take on or leave passengers only at alternate cross streets, which shall be properly designated, and that effective power brakes be adopted.

In conclusion, we draw attention to the comment made in the report upon the plea of the elevated railroad management that during rush hours their cars are only partly filled toward the end of the runs. In reply the Merchants' Association makes a statement which every transportation company in this city would do well to ponder: "Franchises for street railways," says the Association, "are granted for the accommodation of the citizens, and not merely for the companies to make a profit. It is not to be admitted that the companies have any right to run only enough trains to be profitable at all times."

TORPEDO EXPERIMENTS WITH THE "BELLEISLE" BY THE BRITISH ADMIRALTY.

Another interesting experiment has been carried out by the British Admiralty upon the target vessel "Belleisle," which has been the subject of several previous gunnery tests. The object of this latest experiment was to ascertain the effect of a torpedo exploding beneath a battleship, and also the value of cellulose, which is an American material made from corn pith, as a means of preventing the inrush of water into a ship after the penetration of the hull by collision or gunfire. It is contended that the cellulose, if rammed tightly in the double bottom of a ship, would offer resistance to the inrushing water and yet would not expand to a sufficient extent under the influence of water saturation, to burst open the side of the vessel. Previous trials upon a small scale, which were carried out some time ago, substantiated this claim, but the present test was carried out upon a much larger basis, and under conditions closely resembling actual warfare. On the port side of the "Belleisle" a compartment was specially constructed to represent a section of the latest type of armorclad. The compartment was 20 feet in length by 3 feet in depth, and protruded from the side of the target vessel for some two or three feet. Into this section a quantity of cellulose was tightly rammed, rendering it practically solid. A torpedo of the type used in the British navy was lashed alongside this section, and was connected by electric wires to the "Vernon" torpedo training school, a safe distance away. The "Belleisle" was towed to the outer harbor, and moored in 25 feet of water, with a depth of 10 feet below the keel of the vessel. The

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torpedo charge was electrically fired from the "Vernon." There was a terrific explosion, and a huge column of water was hurled into the air to a height of some 140 feet. The target vessel was completely buried in spray, which was thrown right over her mast tops. The ship reeled heavily under the force of the explosion, and before the water had settled down she commenced to founder. Arrangements had been made to tow the torpedoed vessel back again into the harbor immediately after the explosion, but the bottom of the vessel was damaged far more extensively than had been anticipated by the force of the explosion, and it was found impossible to tow the battered hulk back again into the harbor in time. The powerful tugs which were in attendance for this purpose thereupon set to work and pushed the foundering ship toward the shore, and succeeded in running her aground on a mudbank, where she was beached. The ship is to be patched up and rendered sufficiently watertight to enable her to be towed back into the harbor, where she will be drydocked in order to enable a minute examination of the damage wrought by the explosion and the resisting qualities of the cellulose to be made. As several portions of the cellulose, however, were hurled into the air, it is apparent that a portion of the specially constructed compartment packed with the cellulose had been blown up also. The exact extent of the damage, however, will not be known until the vessel has been docked.

EUCALYPTS AND THE WORLD'S FUEL.

BY V. E. JLINE.

The world's impending wood famine, which is predicted both by foresters and publicists, is likely to be averted after all through the planting of eucalyptus forests. As a result of the scientific enthusiasm of the late Baron Ferdinand von Mueller, government botanist of Victoria, Australia, large areas in every continent are being planted to this phenomenally fast-growing hardwood genus. Conditions to-day seem to promise fulfillment of his prophecy that "eucalypts are destined to play a prominent part for all time to come in the sylvan culture of vast tracts of the globe." To that prediction this eminent scientist added the significant belief that for hardwood supplies, for sanitary measures and for beneficent climate changes, many of the countries of the earth would have to rely on eucalypts during uncountable periods.

Dr. Alfred James McClatchie, agriculturist and horticulturist in the employ of the United States, says that all who have lived where eucalypts grow can realize fully the force of Von Mueller's prophecy and the great value of the genus to mankind, both present and prospective.

Inasmuch as it is claimed for the eucalyptus that it is the most useful of all trees, it is a matter of considerable scientific and economic interest that the cultivation of the genus in America is being conducted on a generous scale. In fact it may surprise many to learn that the eucalyptus has been planted more extensively in America than any other exotic forest tree.

Among other important things, eucalypts are held by foresters to be unequaled as a forest cover, as windbreaks, as shade trees, as a source of timber, fuel, oil, and honey, and as improvers of climate.

Although only a few varieties have thus far been tried in this country, the success achieved in adapting them to American soil warrants the government scientists conducting experiments in saying that the tree has already served more esthetic and utilitarian purposes than all other forest trees that have been planted on this continent.

Thus far in America experiments have been made only with tropical and subtropical varieties. The genus includes about 150 species, some of them adapted to tropical swamps, others to desert sands, and still others to lofty altitudes.

The fact that they grow rapidly and in a great variety of soils and climates has led Dr. McClatchie to make experiments with a view to utilizing them as forest covers in mountainous and hilly districts and on the plains of America, and particularly for the reforestation of burned districts. He states that the rapid-growing species, less resistant to frost, may be planted on the lower part of mountains, and the somewhat slower growing, more hardy ones farther up the mountain sides. Those adapted to Alpine situations may be planted to a height of from 4,000 to 6,000 feet.

Hitherto in the introduction of eucalypts many mistakes have been made. In southern Arizona, for example, the blue gum does not endure the heat of summer, while in Florida the frosts of winter have been fatal to it. But in some of these places more resistant varieties have been introduced and are growing satisfactorily. Dr. McClatchie predicts that a more careful and systematic study of the genus, accompanied by cultural tests, will undoubtedly result in the discovery of additional and probably better species for these and other regions. He adds that the introduction of heretofore untried species is continuing, and that every year witnesses some new departure in their propagation. The development of these trees is being closely watched by those interested in their planting.

As to the rapidity of growth and consequent value of the eucalyptus as a wood supply, it is interesting to know that when they are five to seven years old, groves of blue gum or manna gum may be cut to the ground for fuel and they may be cut every six or eight years thereafter. The yield from each cutting is commonly from fifty to seventy-five cords of four-foot wood per acre. One seventeen-acre grove between Los Angeles and Compton set in 1880 and cut for the third time in June, 1900, produced 1,360 cords, an average of eighty cords of four-foot wood per acre. In much of the Southwest there is no known species that can take the place of other rapidly disappearing woods and at the same time supply the increasing demand for hardwood fuel. In California the leaves as well as the wood are utilized for fuel purposes. A Los Angeles company is making for market bricks composed of blue gum leaves and twigs mixed with crude oil, and the product is reported to be an excellent fuel for domestic use. The entire tree is thus utilized. This new use of eucalypt leaves suggests to Dr. McClatchie the possibility of many industries growing out of the extensive planting of the trees.

The phenomenally rapid growth of these trees has been demonstrated in the groves of Ellwood Cooper near Santa Barbara, Cal., where blue gums planted twenty-five years ago are as large as oaks whose rings show them to be 300 years old.

Word comes through American consuls that eucalypts seem destined to revolutionize sylviculture in France, Algeria, Italy, Spain, Corsica, Portugal, Cape Colony, and the Transvaal. That the treeless regions of South Africa are being covered with fast-growing eucalyptus forests is a matter of much significance to that new empire of civilization.

The French are reported to be the most active and intelligent in Europe in propagating the tree. Hardly less sanguine than the French are the Spaniards, who hope by cultivating the eucalyptus to secure an ample supply of woodland and wood.

In Australia and the neighboring islands eucalypts are one of the important sources of the general timber supply and are the chief source of the hardwood timber used there. The uses made of eucalyptus timber are remarkably diverse. It enters into the construction of buildings, ships, bridges, railroads, piers, telegraph lines, fences, paving, vehicles, agricultural implements, furniture, barrels, and a great variety of minor articles. In notes on the commercial timbers of New South Wales, Mr. Maiden names twenty-five special purposes for which the timber of eucalypts is used in that colony. Not only in Australia is the timber of eucalypts used thus extensively, but it is exported in large quantities, the bulk of the hardwood lumber shipped being from these trees. R. Dalyrimple-Hay, in his work entitled "The Timber Trade of New South Wales," names thirteen species that furnish timber for export. Shipments are made to distant parts of the globe, including Africa and England.

The piers at Santa Barbara and at neighboring sea towns are maintained with piles of the blue gum. Mr. Cooper has sold from his grove nearly $10,000 worth of piles in the last ten years. At one seaport the superior value of eucalypt piles is reported to have been demonstrated through the surreptitious acts of a contractor. Lacking a few piles of the timber specified in the contract (Oregon pine), he is said to have obtained blue gum timbers from the vicinity and to have ordered the night crew to place them on the inside where their presence would not be detected. When it became necessary to repair the pier a few years ago, sound piles were found among others nearly destroyed, and upon examination they proved to be blue gum trees. The demand for the piles is now greater than the groves of eucalypts can supply. It seems probable that eucalyptus piles may become one of the important crops grown by farmers in some sections of America. As the trees now planted become larger, and as planting becomes more extensive, the eucalypts undoubtedly will prove their value for an increasing variety of purposes. Dr. McClatchie makes it clear that the eucalypts have not been grown long enough in America to have become a source of lumber here. The principal uses made of the timber thus far in America are for fuel, piles, posts, for some of the parts of farming implements, and for pins for insulators on long-distance transmission keys. He adds that the eucalypts deserve to be better known.

In Germany eucalyptus oil is regarded as an excellent remedy in consumption.

Among scientists there is some variety of opinion concerning the effect of the eucalyptus upon climate. Dr. McClatchie sums up the controversy by stating that when the nature and habits of the trees are considered, it is entirely reasonable to believe that they have an effect in benefiting the atmosphere in the region of their growth. His grounds for this belief are: First, their great capacity for absorbing moisture from the soil and thus reducing the quantity of stagnant water in the ground at their roots; second, their corresponding power of giving off fresh from their foliage the water thus taken up; third, the exhalation from their leaves and other parts, of volatile oils, which affect the climate not only directly but by changing the oxygen of the atmosphere to ozone; fourth, the purification of germ-infested matter by the foliage dropped upon the ground or in pools of stagnant water.

Notwithstanding the tree's capacity for absorbing water some varieties thrive on arid plains. At the close of the season of 1900, the driest one of which the Weather Bureau has a record, trees of several species of eucalypts were observed growing without irrigation in Southern Arizona, and some of them had not been irrigated for many years. Trees of the red gum (*E. rostrata*), the sugar gum (*E. corynocalyx*), and of *E. tereticornis*, growing in a neglected tract under desert conditions where the ground water was about 100 feet below the surface, endured the above trying summer.

SCIENCE NOTES.

A second specimen of the African quadruped known as the okapi, discovered by Sir William Johnston, has been secured by Mr. Walter Rothschild for his extensive zoological museum at Tring (England). A special expedition was organized in Central Africa to secure a specimen from Congo Forest, dead or alive. That which has been received by Mr. Rothschild is the skin and skull of an adult okapi.

A Russian doctor named Loudon, of St. Petersburg, has published some interesting observations relative to the action of the Becquerel rays on the nervous system and on the eye. He found that when a box containing bromide of radium was placed in a cage in which mice were kept the animals became paralyzed and comatose, and died in five days. He also found that persons who are either totally blind, or have only the feeblest possible perception of light, are peculiarly sensitive to the Becquerel rays, and are able to form visual conceptions of the contour of objects the shadows of which are shown on a screen by means of the rays.

The Russian Naval Department some time ago dispatched Lieut. Bolsher, of the Imperial navy, to France, to study the question of the utilization of balloons for reconnoitering and other operations for naval purposes. Lieut. Bolsher has completed his investigations, and as the result of his observation he is to carry out a series of experiments as follows: Increase of the radius of action of wireless telegraphy by balloons; signals by balloons by day and by night; night reconnaissances by the aid of balloons; reconnaissances by the aid of free balloons; motion of free balloons at an angle of 70 deg. with the direction of the wind by means of the apparatus devised by M. François Hervé, which was employed so successfully in the Mediterranean; and lastly, measures to be adopted in connection with the ascent and descent of balloons by sea and land.

The French Admiralty has been carrying out a series of experiments to ascertain the effect of torpedo explosions in the proximity of, and from firing of torpedoes from, submarines. For these trials the submarine boat "Naïade" was employed. In the first test several sheep were placed in the vessel, which was submerged outside Cherbourg Harbor. A number of torpedoes were then exploded at distances varying from 90, 120 to 150 feet from the submarine. When examined the sheep were found to be apparently unaffected by the force of the concussion. The members of a special commission and the crew then embarked on the "Naïade," and fired torpedoes from the submarine at the target only some 180 feet away. The results were excellent, but the explosion of the torpedoes entailed a severe strain on the hull of the vessel. From these experiments it is concluded that firing at short ranges does not militate against the habitability or navigability of a submarine, and the results being more deadly, short range is to be preferred to long-distance firing.

A French botanist in the course of his explorations a few weeks ago in the sandy plains of the French Congo discovered a plant, the bark of the many radiating roots of which contained a large quantity of fibrous rubber. At the time scarcely any attention was paid to the discovery, but owing to the present scarcity of rubber and its high commercial value, which is in reality so prohibitive as to prevent a very wide employment of the substance, attempts are being made in England to turn this new discovery to commercial use. The plant also thrives profusely in northern Nigeria, and it is these forests which are to be exploited. A sample of the plant has been analyzed by the botanical authorities of Kew Gardens, London, and these investigations show that the rubber exists in the roots in sufficiently large quantities to warrant development. The name of the plant is *Landolphia Thrallonii*. It is to be found in many places on the west coast of Africa. One firm which is already engaged in the manufacture of this rubber is placing it upon the market at 75 cents per pound, and it is in every respect equal to the ordinary rubber.

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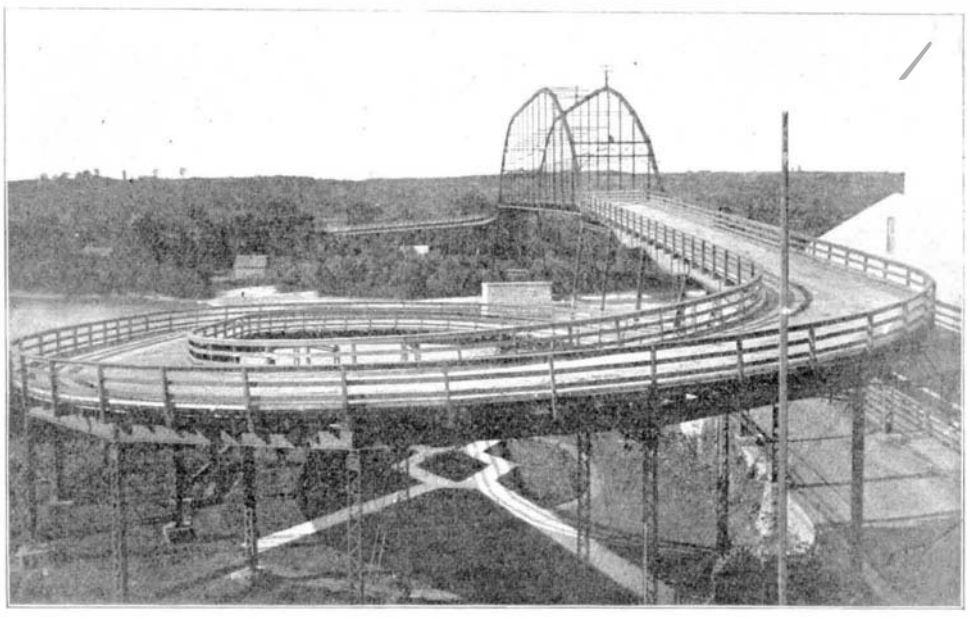
A NOVEL SPIRAL BRIDGE.

The High Bridge across the Mississippi, at Hastings, Minn., was built by the Wisconsin Bridge and Iron Company, of Milwaukee, at a cost of $40,000. The work was commenced September 25, 1894, and the bridge opened to the public as a free bridge April 27, 1895. This is the only free bridge between St. Paul and Dubuque, Ia. The bridge and approaches are constructed of steel and extend 75 feet above low-water mark. Its length is 1,970 feet, including approaches, and it has an 18-foot driveway and 4½-foot walk, which terminates at the spiral approach end in a stairway.

The idea of a spiral approach was conceived by the late Mr. John C. Meloy, a resident of the city, who also donated the ground upon which it is built. The object in view was to build an approach that would not necessitate the crossing or occupying of some of the principal business streets of the city, and at the same time would be long enough to make an easy grade.

The spiral is a complete success in every detail, and heavily laden teams find it just as easy to ascend or descend as the straight approach on the opposite end of the bridge. The ground inclosed within the spiral has been converted into a park.



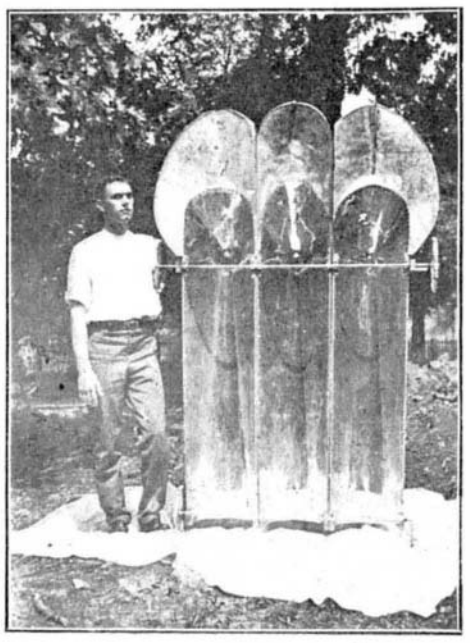
SPIRAL APPROACH TO BRIDGE OVER THE MISSISSIPPI AT HASTINGS, MINN.

THE BERLINER AEROPLANE.

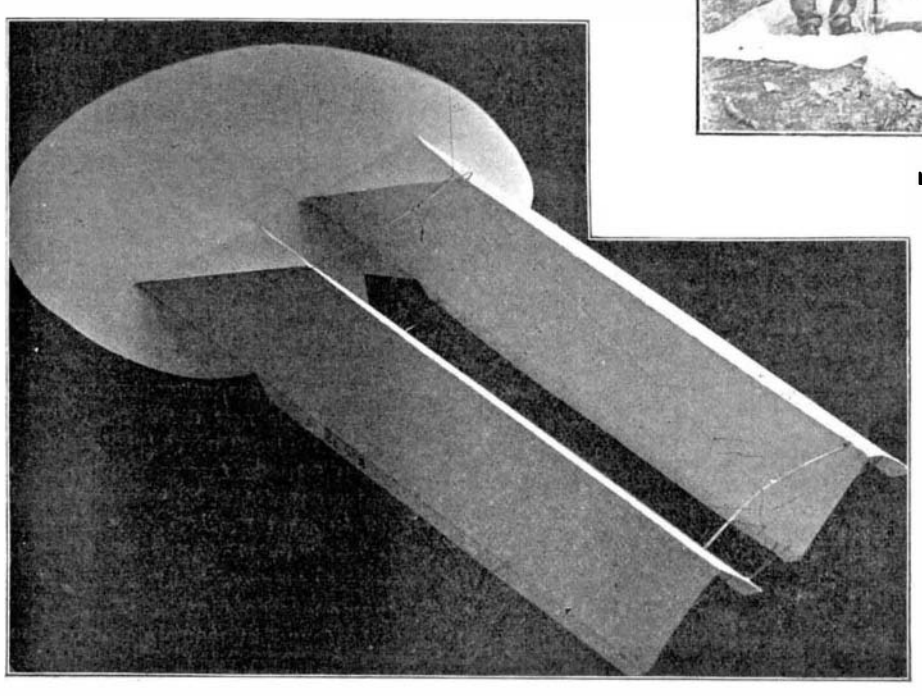
Great attention has been given to the subject of mechanical flight by Washington scientists, notably Prof. Alexander Graham Bell and Mr. Emile Berliner, the well-known inventor. Mr. Berliner recently designed a small model of a flying machine which lifts, in flying, a weight of over one pound for every square foot of horizontal area at a speed estimated at less than 20 miles an hour. The model is of aluminium and tin plate, with rods of oak and metal tubing for supports. It weighs about 34 pounds including ballast. The motive power for horizontal propulsion was supplied by two common skyrockets, attached to the rear of the machine, which is 7 feet long. On August 19 it lifted itself from the ground and attained a height of 8 feet, maintaining itself for a distance of 40 feet at an almost even height of 3½ feet from the ground. No launching device was employed, a push of the hand being given in starting. The main body consists of arches opened below and sloping down in the rear, where wide tail ends are attached. The arches in moving forward tend to produce a current of compressed air, and at the same time exert a parachute action which helps to support the entire structure, but the main lifting is done by the inclined and spreading tail pieces catching the air current. Wheels are attached to the body to facilitate the attaining of initial speed on any fairly smooth surface, and they have now been mounted elastically in order to modify sudden shocks should the machine strike against a hard surface. The horizontal area of the machine is 30 square feet. During the recent experiments the ballast was lifted to the rear of the machine. It then rose to a height of about 8 feet, after 40 feet travel, then turned backward, and was damaged coming down on the unprotected back. The rapidly moving aeroplane is considered by scientists to be the proper solution of the problem of mechanical flight, and the principal endeavor of experimenters in this line of work has been to provide a motive power which is both light and of sufficient propelling force to move a given weight of aeroplanes rapidly forward through the air.

The experiments of Mr. Berliner are not of recent origin. Eighteen years ago he constructed a full-sized model flying machine, which was not successful, and nearly thirty years ago, in a communication to the SCIENTIFIC AMERICAN, he proposed the very principle of propulsion of flying machines, a stream of compressed air or gas, which he is using in his experiments.

Mr. Berliner is now engaged in the construction of a small improved model having a small car attached underneath, with which he intends to make elaborate experiments in order to arrive at more correct data for ascertaining the lifting power per square foot of the horizontal area of his machine. The new model will be sufficiently large to serve as a basis for designing a machine capable of lifting, besides its own weight, a person and the motor for propelling the machine at a possible rate of 20 to 30 miles an hour.



ıe Aeroplane.



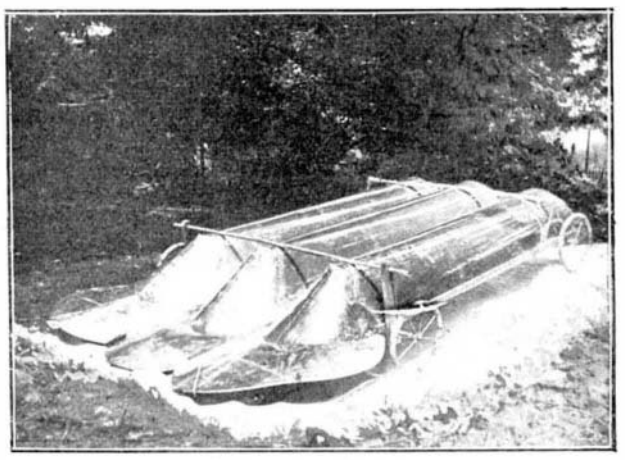
Cardboard Model of Aeroplane.

An Ancient Wood Carving.

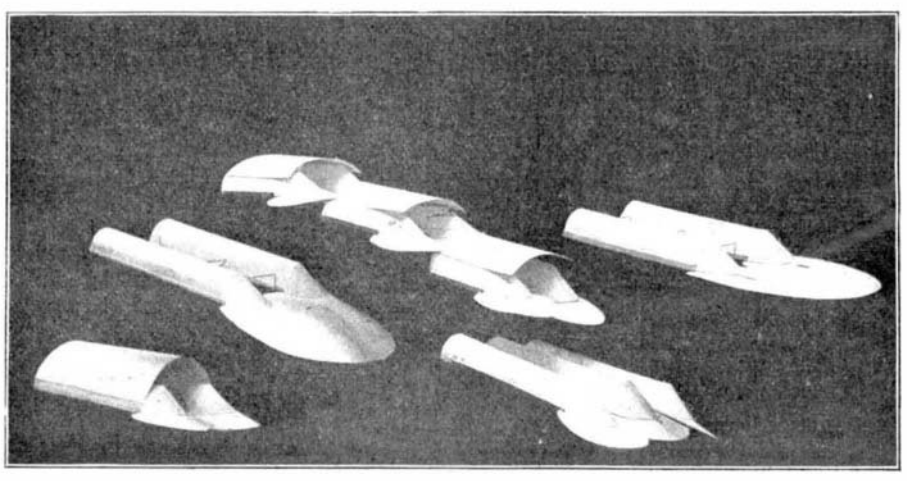
The most ancient specimen of wood carving known to exist, a statuette—it is of sycamore—is in the Museum of Gizeh, at Cairo. It dates from B. C. 3900, so is very nearly 6,000 years old, and still the wood is as sound and good as if of recent date. It was found at Sakkarao, and it is supposed to represent one of the overseers of the workmen engaged in building the pyramids which abound in the immediate neighborhood, and which comparatively recent discoveries have proved to be the oldest of all the pyramids of Egypt. The statuette is known as the "Skeikd-el-Beled," or "Sheikh of the Village," a name given to it by the Arabs who found it, because its features represented very closely those of the man who was then their own sheikh. In this specimen is seen a wonderful instance of how human nature, through the roll of thousands of years, keeps on repeating itself. The statuette is distinctly a portrait, showing a well-fed, closely-shaven man of fifty, or thereabout, altogether nude, save for a cloth bound by a leather girdle about his loins, and reaching down to his knees. He stands erect, and in the right hand grasps a staff, but the latter is not generally considered to be a part of the original. The exact height of the statuette is 3 feet 8½ inches. A careful cast in plaster of Paris of this wonderful old carving was made early in 1894, and may now be seen in one of the Egyptian galleries of the British Museum.

The spinthariscope is an instrument invented by Sir William Crookes for the purpose of studying the wonderful radio-active properties of radium. The instrument is composed of a very high-power system of lenses, set in one end of a tube about 1½ inches long. At the other end of the tube, a speck of radium is carried on a moving iron finger. The finger can be shifted across a fluorescent screen, and placed at one end of the tube opposite the magnifying lenses at the other end. As the fluorescent screen and the radium are in close proximity, the screen is subjected to a complete bombardment. When the minute fragments of radium strike it they become visible, producing an effect similar to the sheen of moonlight on rippling water. Although the particle of radium in the spinthariscope is microscopic, still X-ray photographs have been made with even so small a speck as this.

On Sunday, August 2, that section of the Adirondack branch of the Delaware and Hudson narrow gage railroad running from Lyon Mountain to Lake Placid, a distance of 48 miles, was changed to full gage, thus giving the Delaware and Hudson a through line from Albany to Lake Placid.



The Aeroplane at Rest.



Cardboard Models.

BERLINER'S FLYING MACHINE.

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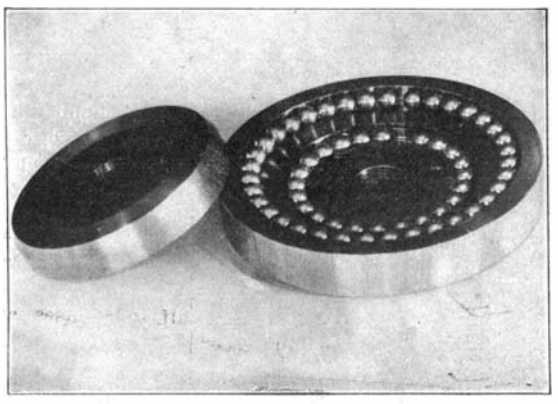
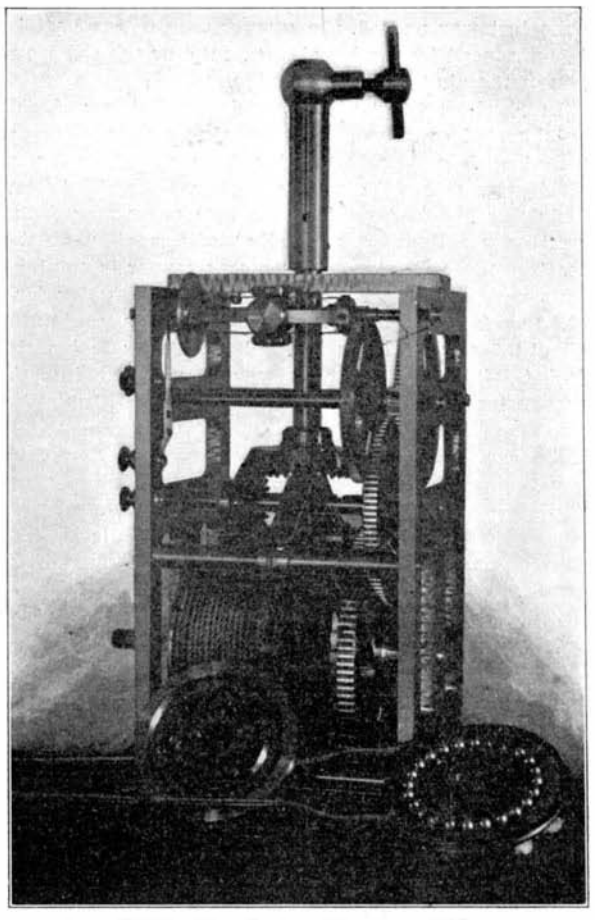
REVOLVING LANTERNS FOR LIGHTHOUSES.

VERY few persons realize the difficulty of making the Fresnel lenses used in our lighthouses. The United States Government has afforded experts in this country every opportunity to learn the art of making these refractors, but up to the present without success. One of the most prominent American optical firms was given one of these lanterns to copy, but after nearly a year of experiment was obliged to abandon the attempt. Consequently Uncle Sam has to send abroad for his lighthouse equipments. There are only four makers of these lenses in the world—one in England, and the other three in France. Most of our equipment comes from the latter country. The difficulty of making these lenses will be realized when one stops to consider that the rays from the lamp must be accurately refracted so as to lie parallel with each other from their source to the pilot house of a vessel just appearing over the horizon, a distance of from 10 to 25 miles, depending upon the height of the lantern above the sea. The variation of a slight fraction of an inch at the lens would obviously be exaggerated many thousand-fold at the horizon. The same holds true in the mounting of the lenses. This is also done abroad, so that whenever a lens is broken it must be shipped back to Europe for repairs. Fresnel lenses have been almost universally used in the lighthouses of Europe and America for half a century; but owing to the isolation of most lighthouses, few people are acquainted with their appearance, or know how they differ from other lenses. In 1822 Augustine Fresnel made a lens whose outer surface, instead of being continuously spherical, was made in steps or concentric zones. The thickness of the lens was thus reduced to a minimum, thereby diminishing the loss of light by absorption in passing through the glass. Most lighthouses are so situated that it is necessary for their light to be spread over the entire circle of the horizon, and in order to meet this requirement Fresnel early in his experiments invented the cylindrical lens—a lens having the shape of the solid generated by revolving the middle vertical section of the ordinary Fresnel lens about a vertical axis. The cylindrical lens bends the rays to a horizontal plane, producing an equal distribution of light in a narrow zone which illuminates the entire horizon. A later improvement on this lens was the use of separate glass prisms or rings of triangular section mounted above and below the main cylinder in such position as to intercept the rays passing upward and downward from the lamp and swing them about into the common, horizontal plane. The use of glass prisms for this purpose was found to effect a great saving over metallic reflectors, due to the fact that the latter absorbed a much larger part of the light. The saving is estimated at nearly twenty-five per cent. In order to afford mariners some means for identifying various lighthouses, a system of flashes has been adopted; that is, while certain lighthouses have a fixed light, others are so arranged as to send out flashes of light at varying intervals of time. The flashes are accomplished by the use of a polygonal frame provided with annular lenses, which is revolved about the lamp by clockwork. This produces a series of beams of light constantly sweeping over the horizon. The mariner then sees a light only when the center of a lens passes directly between his eye and the lamp, and he remains in darkness until the next beam of light comes into line with his eye. Different lighthouses can thus be readily distinguished by varying the number of flashes per minute that the lantern casts. It will be observed that flashing lights are much more powerful than fixed lights, for the light cast instead of being spread over the whole horizon is concentrated into four, six, or eight separate beams. Three types of flashing lanterns are illustrated herewith. The four-sided lantern which we show is not provided with refracting prisms above and below the main lens. It belongs to the fourth order of light, and is the type of lantern used in the Romer Shoal Lighthouse, at the entrance to the New York Lower Bay. This lighthouse, which is shown with the initial of this article, is arranged to send out a flash every four seconds. The revolving lantern has ball bearings on the main standard which supports the clock mechanism. The clockwork is operated by a weight hanging in a shaft extending vertically through the center of the lighthouse.

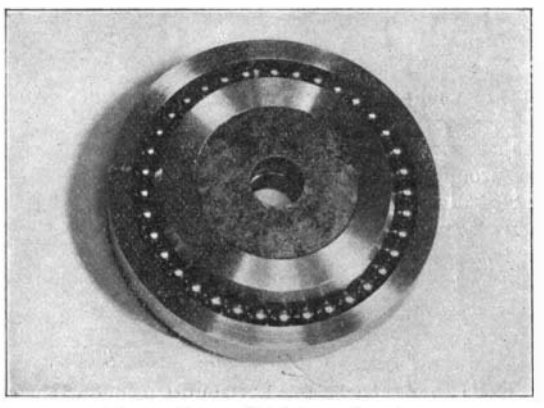
Another engraving shows a more powerful lantern, which is operated by clockwork mounted at one side. This lantern, it will be observed, is provided with the glass prisms above referred to, for utilizing the light which is not intercepted by the main lenses. The lantern is of much higher order, and is mounted



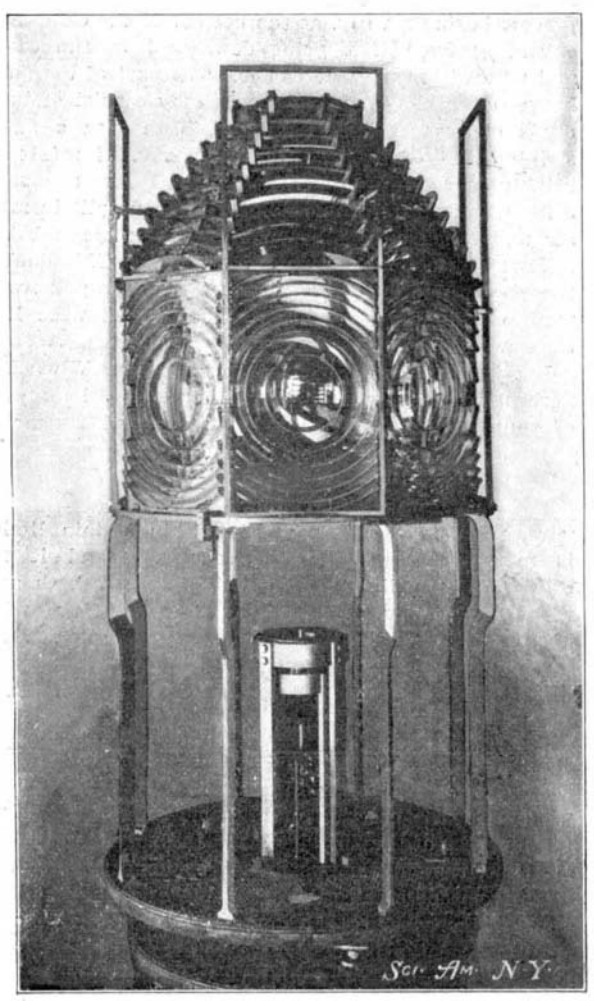
Lower and Intermediate Cones of Lantern Bearing.



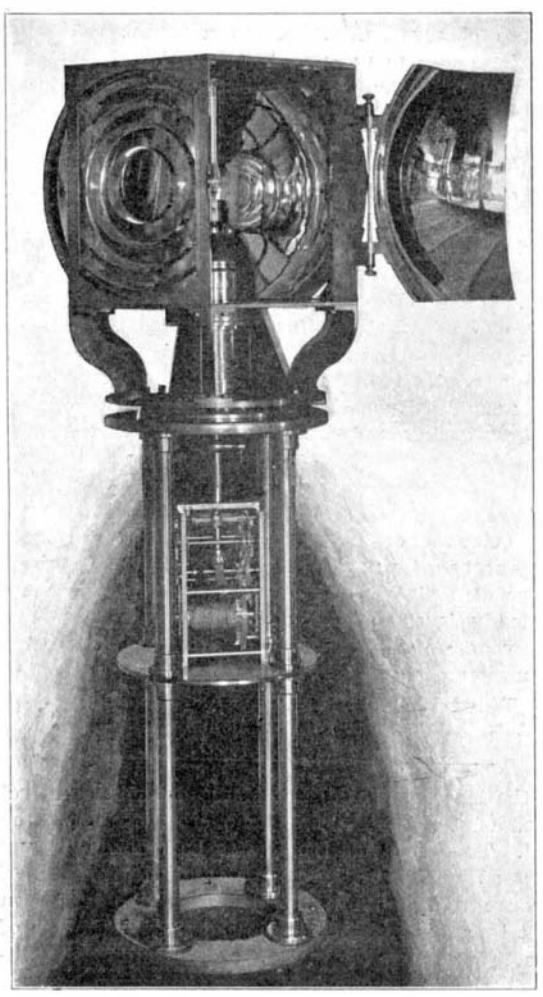
Operating Mechanism for Revolving Lantern.



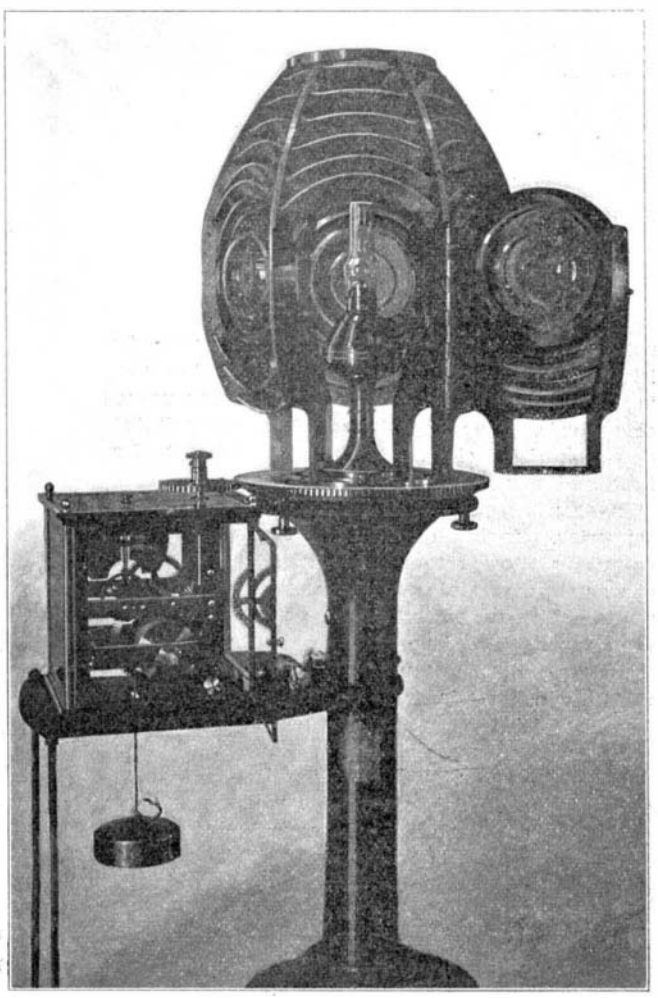
Upper Cone of Lantern Bearing.



Flashing Lantern with Colored Slides.



Four-Sided Flashing Lantern.



Flashing Lantern with Reflecting Prisms.

REVOLVING LANTERNS FOR LIGHTHOUSES.

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on an improved type of ball bearing which is illustrated in two of our views. The lower cone of this bearing is provided with two concentric raceways for the steel balls. An intermediate cone has bearing on the inner circle, and over this is placed the upper cone, which bears on the outer circle of balls. This upper member is also provided with a raceway, in which is a series of balls bearing on an outer bearing surface of the lowest cone. As a result of this triple ball bearing, friction is reduced to a minimum, and a lantern thus mounted has actually been revolved by the breath of a man blowing on the lenses.

The third type of lantern illustrated herewith is one adapted to cast different colored flashes of light. The revolving lantern is provided with frames placed before every other lens. These frames are adapted to receive sheets of colored glass. Ordinarily, red glass is used, and the effect would then be, first a flash of red and then one of white, and so on in alternation.

THE BESSEMER COPPER PROCESS.

THE LATEST METHOD OF COPPER CONVERTING, ACCORDING TO PAUL DAVID.

As is well known, nearly all copper is now produced according to the Bessemer method, by blowing compressed air through the matte, whereby the oxygen of the air oxidizes the sulphur of the metallic sulphides, which escapes as sulphur dioxide. In this formation of sulphur dioxide a great amount of heat is liberated, which is sufficient to keep the matte molten for a long time.

When John Holloway made experiments in England in 1878-79 with a common Bessemer converter as used in producing steel, he did not succeed in producing pure copper, and it was maintained at the time that the cold air rushing through the melted copper produced partial solidification, and thus made an end to the process.

In producing steel in the Bessemer converter, the blast of air is forced through the bottom of the converter from below, and passes up through the molten cast iron. In the year 1883, Pierre Manhès and Paul David succeeded in bringing the Bessemer converter into use for raw copper matte. They placed the blast orifices horizontally in the converter about 30 cm. above the base. The great advantages of the process were immediately recognized in America, where at present this process is used in all copper smelters. It is of course only practicable where the ores contain a certain percentage of sulphur, for in the Lake Superior district, where unalloyed copper is found, other methods must be employed in producing pure copper.

During the last four years the process has again been improved under patents granted to M. Paul David. In 1899, in the historically celebrated copper smelter at Eguilles, near Avignon (France), belonging to the Société des Cuivres de France, he succeeded in constructing a converter which differs entirely from the old form in being spherical and possessing a so-called "pocket" or extension near the mouth. In this "pocket" is to be found the main advantage of the David process, which is based upon the well-known fact that, in forcing the air through molten copper matte, the precious metals lose their sulphur first and sink to the bottom as alloys, at the same time taking with them the main impurities of the matte, such as lead, zinc, nickel, cobalt, arsenic, and antimony.

This "bottom" copper contains all the gold which might exist in the matte, silver, however, being only represented by about one-fifth of its total weight. In Eguilles this bottom copper is cast into anode plates and subjected to electrolysis. According to the old method, the impurities were found in the end product, i. e., in Bessemer copper, while now these impurities are to be found almost entirely in the so-called "bottom" copper. In copper which is to be refined by electrolysis, the impurities often necessitate the changing of the electrolysis baths at the cost of much time and money.

In drawing off the David bottom copper from the converter, one-eighth to one-tenth of the total copper output is allowed to flow through the pocket. The charge then remaining in the converter contains much matte, with from 85 to 90 per cent copper, which, after the drawing off of the bottom copper, is again subjected to the "blow" until 99 per cent copper is obtained, which is then cast into bars. The "converter" copper, which is very pure, is then melted and "poled" in order to reduce the oxides of copper which result from overblasting. This melting also has the effect of liberating all sulphur dioxide which may have become inclosed in the mass. A second advantage of the David converter is that by placing the tuyeres obliquely in the lining, the molten matter is given a hyperbolical rotation. This motion of the molten matte has three advantages, as follows:

I. The air is thoroughly distributed; hence a quicker oxidation is brought about.

II. A very small amount of the matte is thrown out of the converter during the blow.

III. There is more uniform corrosion of the lining through the formation of iron silicate slags.

Herein lies the explanation of the fact that the copper smelter in Eguilles, since the adoption of the "converter," has been able to reduce the cost of production 40 per cent.

Eguilles is the only place on the Continent where the so-called "pyritic smelting" is used. By "pyritic smelting" is to be understood the smelting of copper ores (without any previous roasting) direct in water-jacket furnaces. The same John Holloway, who in 1879 caused experiments to be made in connection with his work on the Bessemer process, found that in smelting copper ores which were rich in sulphur, very little coke fuel was needed, the greater part of the heat being produced by the burning of sulphur with the oxygen of the air to sulphur dioxide.

In Eguilles the work proceeds as follows: Richly sulphureted copper ores from Spain and Algiers are mixed with copper carbonates from the Département d'Hérault, and with native copper from Turkestan. This mixture is then brought into the water jacket (with a small amount of coke) and smelted until a matte containing about 25 per cent copper is obtained. This matte is then brought into a second water jacket, and further concentrated to a matte containing about 35 per cent copper, and from this last water jacket it is drawn off by means of a trough into the "converters," where it is blasted for 80 to 100 minutes, until copper of 99.4 per cent purity is obtained. The lining consists, as usual, of three-quarter part medium quartz sand with one-quarter clay, and being, therefore, acidic, it serves to reduce the iron contained in copper ores to a slag, which, having a smaller specific gravity, can be drawn off by properly turning the converter.

A Nest-Building Fish.

BY RANDOLPH I. GEARE.

It is doubtful whether protective mimicry among animals is better exemplified than in the case of the fish commonly known as the marbled angler of the Sargasso Sea (*Pterophryne histrio*). Owing to its peculiar structure, it is a poor swimmer, and it therefore spends most of its life moving slowly about on the bottom, among corals, seaweed, etc., which these fishes closely resemble in color and in outline. They cling, too, to the floating masses of sargassum weed with their pediculated fins, and the color-markings of the fish closely resemble the weed itself. Not only does the weed thus furnish a home for this species, but the fish actually constructs a nest from it and therein deposits its eggs. One of these nests, found in connection with the Hassler expedition in 1871, was described as consisting of a round mass of sargassum, about the size of two fists, rolled up together. To all appearances, it was made of nothing but this gulf-weed, the branches and leaves of which were, however, evidently knit together, and not merely tangled into a roundish mass; for, though some of the leaves and branches hung loose from the nest, it became at once visible that the bulk of the ball was held together by threads trending in every direction among the seaweed. By close observation it became apparent that this mass of seaweed was a *nest*, the central part of which was bound up in the form of a ball, with several loose branches extending in various directions, by means of which the whole was kept floating. On still closer examination the nest above described was found to be *full of eggs*, which were scattered throughout the mass.

Nature has thus afforded a safe asylum for these somewhat helpless fishes, whose cutaneous filaments, which are plentifully provided on the belly, around the mouth, and on the dorsal spines, so nearly resemble the weed itself that predaceous fishes doubtless fail to recognize the living animals, and thus the latter escape extermination.

The ground color of this fish is a pale yellow, and on this light background are darker irregular brownish bands, very much like the branched fronds of the sargassum weed itself, while along the edges of these darker bands, on the bands themselves, and also to a lesser extent upon the rest of the body, are little white specks of various sizes, on an average about the size of a pin's head. These markings, which are regarded by ichthyologists as having been developed in mimicry of the minute shells (*Spirorbis*) with which the sargassum weed is often covered, afford an additional means of protection to the marbled angler from its natural enemies, the larger fishes.

In the Medical World, Dr. Moses describes a novel method of removing a fish bone crosswise from the throat. The bone was too low to be reached by any forceps at hand, and the author recalled a method of procedure told him by an old doctor who had been taught by a boy, namely, to tie a string in the eye of a smooth button and have the patient swallow the button, edgewise of course, and draw the button back by the string. This was done and the bone was promptly dislodged.

Correspondence.

Atmospheric Disturbances.

To the Editor of the SCIENTIFIC AMERICAN:

Below are a few observations in regard to lightning and thunder, which may be of interest to some of your readers.

The distance to which thunder may be heard I find to depend very much on the altitude of the listener. On a somewhat isolated hill, about 500 feet above the general level, I have heard thunder from flashes which were twenty miles away. The flashes were occurring several minutes apart, so that I could see the flash and time its thunder before a second flash occurred. But once on the top of a mountain, about one-third of a mile high, and surrounded by peaks two and three times as high at from ten to twenty miles distant, I heard thunder when there was not a thunder cloud in sight. The pitch was like that of the deepest organ notes. Two hours later a thunder storm, rising from behind mile-high mountains, twenty miles to the south, broke over us.

Once a very long thunder cloud stretched across the sky to the south and southwest of Foochow city. The eastern end of this cloud was over the valley of the Min River; the west end was over mountains which separated the watershed of the Min from that of a tributary, the Yung-fu River. The cloud had evidently spent its greatest force, and the northern side of it was dissolving into the air, so that it did not have a sharply-defined edge, but gradually deepened from the thinnest vapor at the outer edge to the blue-black of the center of the storm. I just happened to see a short flash of lightning pass between the western end of the cloud and the distant mountains, and then the upper end of that flash darted swiftly back, horizontally along the face of that cloud almost to the eastern extremity, in a serpentine course, dividing and branching as it did so till it resembled the picture of a river on a map, or the veins of a leaf. I saw this repeated five or six times, and each time the first short flash seemed to descend from the cloud to the mountain, and then spread itself over the face of the cloud, the operation occupying at least one second, and, I rather think, two or three seconds. The distance was too great for the thunder to be heard.

I was astonished, for I had been taught that the passage of lightning is practically instantaneous, and that our eyes deceived us when we thought we saw a flash descend from a cloud to the earth. But there I saw a flash darting through a cloud, whose progress was no more difficult to follow than that of an arrow from a bow or a ball from a cannon. This was before the days of kodaks and snapshots; but I have often witnessed the same thing on a partial scale. I have also seen the lightning strike many times since then; and it always seemed to descend from the cloud, in a minute yet appreciable moment of time. My explanation is this: The whole cloud is charged with electricity, which can only discharge itself in successive portions thus: *A*, *B*, *C*, *D*, *E*, etc.; *A* going first, and then *B* following *A*, and *C* following *B* and so on, the process beginning, say, at the bottom of the cloud and extending from that point downward to the earth and upward through the clouds. The part of the flash between the cloud and the earth may consist of hundreds of separate discharges. I have seen a flash, striking the earth, lose for an instant its intense brightness, and then regain it again. I have also seen a flash first strike at one point, and then split in mid-air and finish at another point, the discharge being followed by a double report of thunder. This double report was due mainly to the fact that one point was more remote than the other, though both were less than a mile away.

But there is one thing that puzzles me. When the flashes are somewhat distant there is a long *peal* of thunder; but when the lightning strikes nearby, there is just one sharp *crash*, and little or no rumble following it.

I sometimes find in Chinese junk shops old steel wire, from wire cables, which within certain limits is more pliable than soft iron wire, and it retains this pliability though bent back and forth any number of times. But beyond this limit the wire has the rigidity of rather highly-tempered steel. How is this peculiar quality imparted to the wire?

J. E. WALKER.

Shao-wu, Fuchien, China, July 16, 1903.

An effort is being made in England to raise sufficient money for the erection of a memorial to John Kay, the inventor of the "fly shuttle." In every loom before his time, the shuttle was passed by hand through the warp from one side to the other. The invention about doubled the capacity of the operator, and the innovation aroused the ire of the weavers to such an extent that Kay was made the victim of a mob attack at one time, and his house and property destroyed. He died in poverty, and the location of his grave is unknown.

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Automobile News.

The bicycle police of Washington, D. C., have recently had Jones speedometers placed on the front forks of their wheels, and have been instructed to arrest no automobilists for excessive speeding unless, when following them, the speedometer shows that the legal limit is being surpassed. After an official test over a quarter-mile stretch, each instrument that is found to be accurate is sealed and officially numbered, and a record of it is kept for reference. So accurate are the instruments, that none of them has been found to vary more than a fraction of a second during the quarter-mile test at a rate of 15 miles an hour. Of the 72 bicycle policemen, 38 at present have speedometers. These are of a new type, one of which was illustrated and described in the SUPPLEMENT, No. 1440.

On September 17 the Oldsmobile runabout, driven by L. L. Whitman and E. T. Hammond across the continent from San Francisco, arrived in this city, having made the journey in 73 days, on but 57 of which runs were made. The time made by the runabout compares very favorably with that of 65 days, made by Dr. H. Nelson Jackson in a 20-horsepower Winton, and that of 61 days, made by E. T. Fetch in a 12-horsepower Packard, earlier in the season, especially when it is considered that the tourists had very rainy weather and were detained 9 days in Omaha because of a flood and 6 days elsewhere in Nebraska because of the rain and impassable roads. When they once got away from the rain they made very good time, and succeeded in traveling from Omaha, Neb., to New York in 11 days. The machine used was an ordinary 5-horsepower Oldsmobile with wire wheels, its weight being about 900 pounds. The tourists made the trip on their own account, and were not sent out by the company. The next aspirant for transcontinental honors is said to be Mr. H. H. Harkness, who, it is stated, will shortly attempt the trip in the reverse direction, on a powerful touring car of his own make.

This year's automobile endurance test, held under the auspices of the National Association of Automobile Manufacturers, will take place October 6 to 14, over a route 794¼ miles in length, from New York to Pittsburg, Pa., going *via* Kingston, Binghamton, Owego, Corning, Genesee, Buffalo, Erie, Cleveland and Youngstown. The test will be much more severe than the New York-Boston one of last year, and is calculated to show the endurance properties of the 1903 machines over all kinds of roads and grades one is liable to meet with when touring in the middle West. The rules governing the test are to be more rigid than ever before. Perfection in everything, including a hill-climbing and brake test at the end of the run (250 points each), entitles a car to 6,000 points, 3,000 of which are devoted to the run (with the usual one point per minute deduction for penalized stops), 1,000 to weight-carrying capacity, and 1,500 to the condition of the machine at the finish. Each automobile will be required to carry a load equal to 25 per cent of its weight. Instead of the observers traveling the whole journey on the machines to which they are assigned at the start, they will be changed to a different car every day, so that they will have no especial interest in any one car. The manufacturers have set themselves a most thorough test, and unless the weather is bad, the majority will doubtless come through it with flying colors.

The dangers of automobile racing on the track at speeds of 60 miles an hour and under have become quite apparent this month from the numerous accidents that have occurred. In several instances the spectators lining the fence have gotten the worst of it, the operators of the machines being but slightly injured, while in two cases at least the chauffeur has paid the penalty of his daring with his life. On September 3, while practising on a 25-horsepower Packard racer for the coming races on the Glenville track, at Cleveland, Charles Schmidt, by making a sudden swerve to avoid another machine, caused his car to slew and strike the fence, throwing him 20 feet into the inclosure and breaking three ribs. Two days later a new Baker torpedo electric racer had its front wheel taken off by another machine cutting across in front of it, and ran under the fence, injuring several spectators. At the Detroit races, September 9, Barney Oldfield, on the Winton "Bullet," ran off the track and through the fence owing to a tire bursting on the front wheel. A spectator sitting on the fence was killed, and Oldfield had a rib broken and was badly cut, though he kept his seat and was in the car when it finally brought up against a tree. Shortly after this accident, Harry Cunningham, on the Ford-Cooper car, had a similar one. He, too, plunged through the fence, shattering the front wheel of the machine, but fortunately himself escaping injury. September 12, at Milwaukee, Wis., the same car turned a somersault and fell on the chauffeur, Frank Day, killing him. This accident also, it is thought, was due to a tire bursting. At a county fair at Zanesville, Ohio, on September 9, Earl Kiser's racer burst a front tire, causing it to run into the fence and kill one man and injure six other persons besides the driver, who had his ankle broken. On the 17th instant, at St. Johnsbury, Vt., a machine being raced on a track at high speed, dashed off and over a 15-foot embankment, killing Herbert Lamphere, who was acting as mechanic, and very seriously injuring Dr. John H. Allen, who was driving it. All these accidents go to show how dangerous track racing has become, and they should serve as a warning to spectators to keep away from the fence.

Although Gen. Nelson A. Miles has reached the age when all army officers are placed on the retired list, he has shown himself to be still up-to-date and thoroughly conversant with the progress that is being made in automobile transportation in this country. Almost his last official act was the sending of a letter to the Secretary of War, in which he urges the replacement of five regiments of cavalry by a like number of men thoroughly trained and constantly employed in the use of the bicycle, motor-cycle, and automobile. The duties of these men would be those of reconnaissance, with the study of topographical conditions of the country, together with the surveying and mapping of it, as well as the repairing and building of roads and bridges in war times. The five regiments should be regarded as a flying corps and a corps of observation, to open the way for the advance of the army, and obtain all needful information. Officers and men of the cavalry, artillery, and infantry, and of the quartermaster's and medical departments and engineer and signal corps, should serve two or four years with this corps. In our army there are one-half as many cavalry as infantry regiments, while in European armies there are but one-fifth, and in the English army but one-seventh. This large preponderance of cavalry being useless and very expensive to maintain, it should be replaced by an up-to-date corps that would be of great service, not only to the military, but also to the people at large.

The army officers of nearly all the large foreign countries have spent considerable time during the last two years in experiments with the automobile for war purposes. Germany recently appropriated $70,000 for the purchase and maintenance of autos for her army, and at the October maneuvers this year, six of the newly-purchased machines will be used, one of them by Emperor William to direct his army. Six other machines are to be furnished for a thorough test also, by the patriotic German manufacturers. The French, who were the first to apply the automobile to war purposes, recently appropriated $4,000 more for automobiles.

Racing launches propelled by high-power gasoline automobile motors are now all the rage in France. In a recent race from Paris to Trouville *via* the river Seine and the North Sea, such a launch, fitted with a 35-horsepower Mercedes motor, covered the distance at an average speed of 22 knots an hour. Of the 28 launches which started, 25 were of the cruising type and 3 were racers. The number of launches that succeeded in covering the whole distance of 208 miles was 22. Though the sport of motor-launch racing was started and has received a great impetus this year on the other side of the Atlantic, yet the first high-powered boat of this type was designed and built in this country last year by H. S. Leighton, of Syracuse, N. Y. This launch is the "Adios," which has a total length on and above the waterline of 55 feet, with a beam of 7 feet, 9 inches, diminishing to 6½ feet on the waterline. She is driven by a 120-horsepower, eight-cylinder engine of the two-cycle type, connected to a single propeller, and she covered two accurately measured miles on Onondaga Lake last year at a speed of 23 miles an hour. The latest racing launch built in this country is the "Standard," which has a very light mahogany hull, 58 feet, 10 inches long, by 6 feet beam at the waterline, and 1 foot draught. She has a new type, 100-horsepower Standard motor, designed by E. A. Riotte, of the United States Long Distance Automobile Company. This motor is of the four-cycle type, has six cylinders, and runs at a speed of 400 R. P. M. A 41-inch propeller is used to drive the launch. In a race between these two boats over a course of 10½ nautical miles, the "Adios" was allowed a handicap of 3 minutes, 27 seconds, and she succeeded in beating the "Standard" by 12 minutes, 30 seconds, as the latter had to stop for 5 minutes on account of a pump overheating. The "Adios" covered the distance in the elapsed time of 34 minutes, 17 seconds, or the corrected time of 30 minutes, 60 seconds.

The Current Supplement.

In the current SUPPLEMENT, No. 1447, the first article is the conclusion of "The Mechanical Handling and Conveying of Coal and Coke," describing the most recent European practice. "The North Sea Fisheries," "German Engineering Impressions of the United States," "Eyes That See in the Dark," by Dr. Austin Flint, are all most interesting articles. "Aluminothermy" is a curious metallurgical process with special reference to welding. "Electricity and Matter" is a lecture by Dr. Oliver Lodge. "La Strobeika Persane" describes a mystifying trick. Engineering Notes, Trade Suggestions from United States Consuls, and Trade Notes and Recipes will be found in their usual places. The number is a most interesting one.

Engineering Notes.

The directors of the Great Western Railway Company are said to be considering the question of ordering two turbine steamers for their Irish service. They will not be required until the company remove their fleet from Milford Haven to Fishguard, where new docks are being built.

The coal-handling machinery installed at the Lincoln Wharf Power Station of the Boston Elevated Railroad Company recently lowered the world's record for rapid unloading. The coal was raised 90 feet above tide water and delivered to the storage pockets at the rate of 320 tons per hour. The installation follows in general design the standard Hunt steeple tower rig, the moving gear and coal cracker being electrically driven, and the hoisting engine direct connected. The overhang of the folding boom is 40 feet, and the capacity of the shovel two tons.

According to Prof. Richards, of the Lehigh University, the waste gases from a modern blast-furnace are capable of developing 10,000 horse power if utilized in suitable gas-engines. It is interesting to note in this connection that the great Niagara Falls Power Company, up to a few months ago, was only developing some 50,000 horse power by its turbines, and even now, the power available at three modern blast-furnaces would be capable of pumping back again all the water they use. The principal outstanding difficulty in utilizing these waste gases lies in the size of the scrubbers necessary to clean the gases before passing them into the engines. If they are not washed thoroughly free from tar, trouble arises from the gumming up of the valves.

At the half-yearly meeting of the shareholders of the London and North-Western Railway, Lord Stalbridge said the company built experimentally a number of 20-ton coal wagons, but they were objected to because they were too high to go under many of the colliery screens, too wide for the stallages at the collieries, and too heavy for the weighing machines. As the coal traders themselves did not seem disposed to alter the carrying capacity of their wagons, the company determined to continue experiments until it found the most suitable wagon to recommend for adoption by the traders, and it had built vehicles of a carrying capacity of 15 tons. Some of the advantages of these larger wagons to the traders were that they would carry roughly twice as much coal as the majority of their present trucks, while occupying only about the same space in the sidings, and the first cost was very little more than that of the smaller trucks.

The United States Consul-General at Coburg says that a type of oil engines has been invented which has attracted considerable favorable notice. The oil is vaporized and ignited without the use of any external source of heat. The main drawback has been that the engine would not run indefinitely with light loads, owing to the explosions not occurring with sufficient frequency to keep the igniting portion at a sufficiently high temperature. A modification of this type of motor just brought out by the Britannia Company, of Colchester, England, is claimed to be free from this drawback. The vaporizer is arranged, as usual, at the back of the cylinder. On the suction stroke a vapor valve is opened by the cam shaft, and through this valve air is drawn into the cylinder through the vaporizer, into which at the same time a little oil is sucked through an automatic valve. This mixture of air and oil is in itself too rich to be explosive, and the main supply of air is drawn through a separate air valve into the cylinder. Two passages connect the vapor valve with the cylinder. One of these is large and straight, while the other is narrow and U shaped. The lower portion of the U contains the igniter—a piece of metal having ribs, which enable it to absorb heat readily when the explosion takes place. This piece therefore becomes and remains red hot, while the rest of the vaporizer is only at a black heat. The vapor which is drawn through this igniter on the suction stroke is far too rich to burn, but on the compression stroke air is forced back into the igniting piece and provides the necessary oxygen for the vapor already there to ignite. None of the exhaust passes through the igniter, which is consequently not cooled down in the case of a missed explosion. The proportion of oil and gas used is regulated by throttling the air supply. As already stated, part of this air is drawn through the vaporizer and the rest through the air valve. If the admission to the latter is throttled, a greater proportion of the air used will be taken through the vaporizer and will carry with it a proportionately greater amount of oil. The makers claim that, once started, the engine will run absolutely without attention for several hours.

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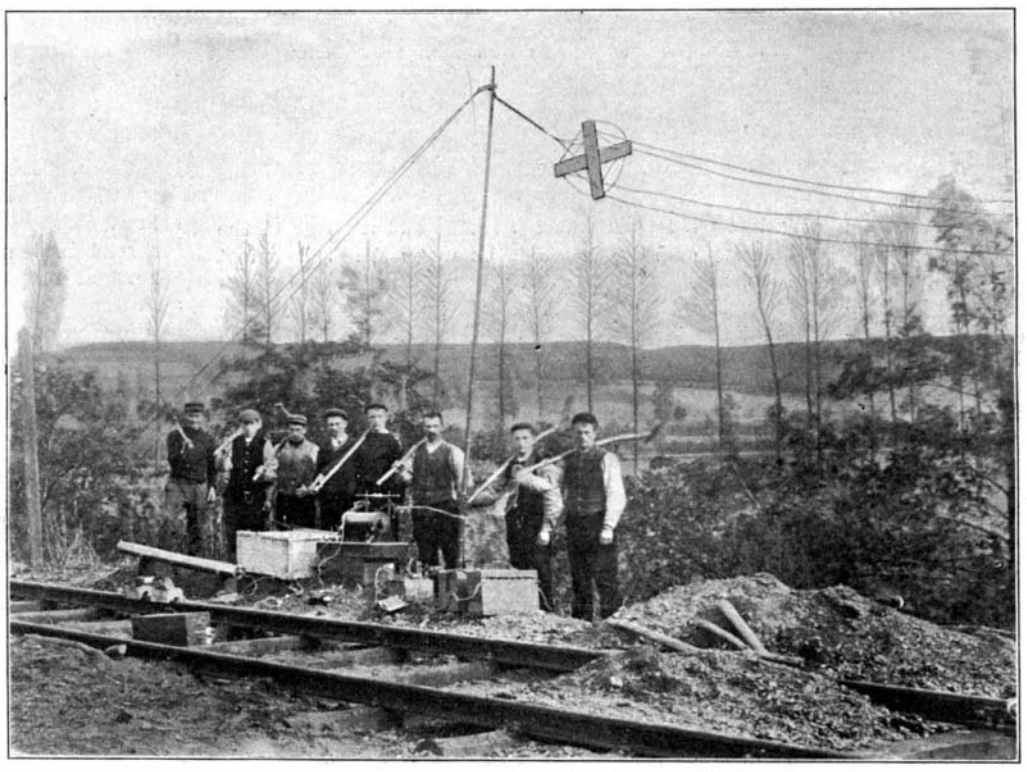
THE HYPOSCOPE.

Our successful contestants for the Palma trophy at Bisley this year brought back with them a little instrument which is destined to play a very important part in the warfare of the future. The instrument is called the "hyposcope," and its purpose is to enable a marksman to fire with accurate aim without exposing his head to the fire of the enemy. The device was invented by Mr. William Youlton, of Brighton, Eng. Mr. Youlton first conceived the idea of such an instrument after the battle of Colenso in the Boer war, during which it is stated that not a single Boer was to be seen, and it occurred to Mr. Youlton that a combination of reflectors might be arranged which would enable the British soldier to remain entirely concealed when in action. The rough model which he constructed as a result of these deliberations immediately elicited favorable comments on all sides, and it was not long before he received an order for a number of these instruments from the British War Office. The instruments were employed with good results during the remainder of the war, their use at Mafeking having received particular mention.

The hyposcope is adapted to be secured to the stock of the rifle near the breech. It consists of a series of mirrors mounted in a tube of inverted L shape; the shorter arm lies across the barrel of the rifle, while the longer arm hangs down at one side. The first mirror reflects the light coming in along the barrel of the rifle to a second mirror at the elbow of the instrument, which directs the rays downward to a mirror at the lower end of the tube, and thence it passes out at right angles to the eye. Thus on looking in at the eyepiece one can see the sights of his rifle, and take accurate aim while holding the gun above his head. The vertical arm of the instrument comprises two telescoping sections, so that, by means of a thumbscrew at the side, this arm may be extended to elevate the device for long-range shooting. The amount of elevation may be accurately determined by means of a fine scale on the upper section. In order to allow for windage, a thumbscrew at the end of the horizontal arm may be rotated to move the mirror contained therein slightly to one side or the other. A scale on this arm shows just how far the mirror must be moved for different velocities and directions of the wind. The entire instrument is very compact and light, weighing about a pound. It is provided with a holster, in which it may be incased to prevent it from sustaining any injury when not in use. The parts, however, are not liable to be easily injured. In case a mirror is broken, a new one can readily be slipped into the old frame. The advantages of this instrument in actual warfare will be apparent to all. Only the muzzles of the rifles are exposed to the enemy, and the soldiers are entirely concealed in the trenches. But aside from its advantages as a means of protection, the device will be found to greatly increase the effectiveness of the firing. It is stated that during the Boer war only one cartridge out of seven thousand was effective, which only goes to show how nervous a man is under fire, for no such work would ever be tolerated in target practice. The fear of being shot while taking aim makes the soldier fire hurriedly and at random; with the hyposcope attached to his rifle no fears will be entertained, and the soldier may fire deliberately and with perfect aim. Aside from its advantages in connection with a rifle, the hyposcope will be found very useful in scouting. By applying it to the end of a field glass, an observer can watch the movements of the enemy without danger of discovery. The same instrument has also been designed for use on Maxim guns, on which it will be particularly useful, judging by experiences in the Boer war, for these guns were always the center of a concentrated fire.



COMMUNICATION WITH TRAINS BY WIRELESS TELEGRAPHY.

COMMUNICATION WITH TRAINS BY WIRELESS TELEGRAPHY.

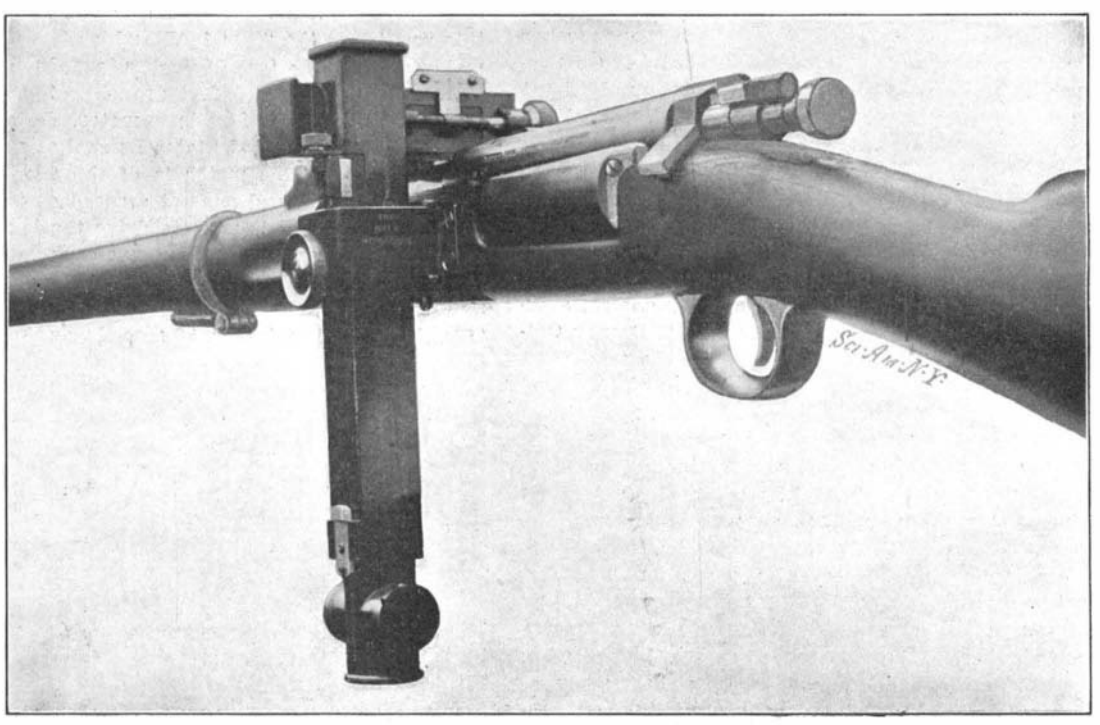
Although certain railroad managements, those of Belgium, for example, question the necessity (especially when they are provided with the block system) of communications of trains with each other and with stations, inventors in the domain of wireless telegraphy have, in recent times, directed their attention to this interesting branch, and experiments are being made on all sides. In England, the Marconi system has been experimented with; in America, the De Forest system; and in Germany, the Braun-Slaby.

All such experiments have permitted of ascertaining the fact that great energy is necessary, even for slight

Marksman Concealed Behind a Sand Bag and Sighting Through Hyposcope.

Aiming with the Hyposcope Over Breastworks.

Seated Marksman Entirely Concealed While Firing.



The Hyposcope Attached to a Rifle.

THE HYPOSCOPE; BY WHICH A MARKSMAN CAN TAKE ACCURATE AIM WITHOUT EXPOSING HIMSELF.

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distances. In order to communicate at a distance of about six miles, it requires, it would appear, no less than one horse power.

The problem is, moreover, much more difficult than might be thought at first sight. The distance of transmission, in wireless telegraphy, as well known, depends before all else, upon the energy brought into play and upon the length of the antennæ. In this latter factor resides the principal difficulty. Tunnels, stations, and bridges prevent the putting of vertical antennæ of more than six or ten feet upon trains. In default of antennæ of considerable height, no other means therefore remains but to increase the energy brought into play. It is to a solution of this problem that experimenters in general are applying themselves. The difficulty might be surmounted, nevertheless, if horizontal antennæ could be effectively employed. But here a new difficulty is confronted. Antennæ placed one after another lose their efficiency. On the other hand, the displacements of the trains produce a respective displacement of each antenna.

As another method, it has been proposed to place along the track, and for its entire extent, a horizontal antenna, connected now with a transmitter and now with a receiver. Another horizontal antenna would be established upon the train and stretched, for example, over the roof of the cars. This system, it will be at once seen, has two disadvantages. In the first place, it necessitates a special wire and consequently involves a very great expense; and, in the second, it does not permit of a communication between trains. A truly simple solution, however, permits of conquering the difficulty, and this has been furnished by M. Guarini and his collaborators, M. Cesar and Lieutenant Poncelet. As may be learned from the Guarini and Cesar Belgian patent No. 167,023 of November 29, 1902, the system consists in employing an existing line of telegraph wires and using others as intermediate ones. For this purpose, there is produced at a point that may be fixed (station) or in motion (train), and that is situated near the said wires, an electro-magnetic disturbance by employing an oscillator, for example. Such disturbance is perceived, notably by means of a coherer, at another stationary or movable point placed near these same wires. These latter, in the first place, take up the waves and afterward radiate them. They therefore play the part of intermediate antennæ.

Some experiments with the Guarini-Cesar system have been performed upon the Belgian State line, have been watched by one of the latter's engineers, and have been crowned with entire success. The energy of 40 watts and an antenna of 4 strands of 32.8 feet sufficed to communicate between West-Saint-Georges and Ottignies, say a distance of 10.5 miles. With an energy of 15 watts, a spark of 1-10 inch, and a good coherer, signals were received at a distance of 2.5 miles, although the antenna of the movable station, arranged upon a small car, was one of but 6.5 feet. It consisted of an iron tube 4 inches in diameter. At the other station the antenna was 32.8 feet. Messages were received in both directions, from the car to the wire and *vice versa*, even when the car was at 100 or 130 feet from the telegraph wires. No disturbances of any sort were observed in the numerous telegraph and telephone receivers placed along the line. This fact is not wanting in interest, and agrees with the numerous researches of such scientists as Slaby, Turpain, and others, who have studied the simultaneous transmission of ordinary and high-frequency currents by means of the same wire.

In order to obtain such results, it was not even necessary to connect one pole of the oscillator, or of the coherer, with the earth. It sufficed to employ a condenser or even a simple capacity consisting of a tube parallel with the earth. Upon the car the ground connection was formed by the axles and wheels.

M. Guarini desired also to ascertain whether the rails might not perform the rôle played by the telegraph wires. With this object in view, some experiments were made after connecting the oscillator with the rails or with antennæ placed near the rail and parallel with it, as shown in our illustration.

With an energy of 100 watts and a sensitive Blondel coherer, MM. Guarini, Cesar, and Poncelet were enabled to receive signals, but at much shorter distances. The system in which telegraph wires are employed might, M. Guarini thinks, prove an economical means of constituting a block system with signals upon the locomotive. The inventor, moreover, from these experiments, draws some interesting conclusions, from a different point of view, but one that seems to have been the motive that led him to perform them. Submarine cables, which are insulated from the aqueous medium that surrounds them, might, perhaps, in his opinion, perform the rôle, in certain cases at least, of intermediate antennæ in wireless telegraphy to a great distance. In such a case, it would be very easy, he thinks, to assure by submarine cables, without interfering with their ordinary business, telegraphic communications between ships and with the coast. He does not favor, then, the bringing into play of the enormous amount of energy to which Marconi has recourse.

RUINS OF PIEDRAS NEGRAS.—ALTAR WITH HIEROGLYPHIC INSCRIPTION.

PIEDRAS NEGRAS.—SCULPTURED LINTEL FROM DOORWAY OF BUILDING.

PIEDRAS NEGRAS, A NEWLY DISCOVERED PREHISTORIC CITY IN GUATEMALA.

BY CHARLES C. WILLOUGHBY, PEABODY MUSEUM, HARVARD UNIVERSITY.

The region comprising the greater part of Guatemala, the western portion of Honduras, and the southern part of Mexico, including the peninsula of Yucatan, was the seat of an ancient American civilization highly developed and as interesting to the archæological student as any of the primitive civilizations of the Old World.

Throughout this region are found numerous remains of ruined cities, or, more correctly, ruins of religious and governmental centers; for religion and government were inseparable among this people.

The Spaniards, upon their arrival, found numerous books among the priesthood, each book consisting of many pages, the leaves being eight or ten inches in length and folded like a screen. The pages were covered with numerals, glyphs, and explanatory drawings beautifully executed in colors, which are supposed to refer to the calendar, to astronomical matters, and to religious ceremonies. The Spanish priests collected and burned every book they could obtain. Fortunately for students, three of the books found their way to European libraries. Their value is now appreciated, and they have been carefully reproduced by photo-lithography and are known under the titles of "Codex Dresdensis," "Codex Troano-Cortesianus," and "Codex Peresianus." Copies are now accessible to all students.

Upon the monuments and altars, upon the lintels, walls, and stairways, and upon the altar slabs within the sanctuaries of the temples are sculptured with elaborate detail hieroglyphs of the same character as those occurring in the codices. It is known that in many instances these hieroglyphs record certain dates by days, months, and longer time periods, but the significance of the great majority of the glyphs is as yet unknown. When they are deciphered, as they are sure to be in time, a flood of light will be cast upon the religious history of one of the most remarkable primitive cultures known.

With the view of bringing together reproductions of all the inscriptions upon the monuments of the Mayan peoples, the Peabody Museum of American Archæology and Ethnology of Harvard University has for several years had expeditions in the field conducting explorations among the ruins and making paper molds of inscriptions from which plaster reproductions have been made. While engaged in work for the Peabody Museum, Toberto Maler, long a resident of Mexico, heard of the existence of certain ruins in western Guatemala known only to the native wood cutters. After a long journey through tropical forests he reached the Usumacinta River, upon the banks of which the ruins lay.

The structures are built upon an irregular plateau or series of connected hills, artificially terraced. A transverse valley opens upon the river at the south of the plateau. At this point is a mass of blackish limestone rocks, visible for a long distance from the river in either direction, and called by the natives *Piedras Negras*. This name has been given to the ruins. Upon the flat surface of the largest of these rocks is sculptured a circle of hieroglyphs inclosing two seated figures. Entering the transverse valley

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and climbing the slope to the north, the ruins of two temples were discovered upon artificial pyramids placed side by side. In front of each temple and upon the upper terrace of the pyramids stands a monument or stela of limestone. Upon the front face of the best-preserved of these has been sculptured with elaborate detail an inscription in Mayan characters. A gigantic stela broken in two pieces lies upon the lower terrace connecting the two pyramids.

Across the plaza to the northwest stands a third pyramid upon a natural elevation. The temple upon its summit is in ruins. A flight of stone steps leads from the plaza to a broad terrace in front of the pyramid. Six large stelæ stood in a row upon the terrace. Hieroglyphs cover the sides of these monuments, and upon the face of one is an inscription, the first few characters of which form the initial series and record dates in the complicated Mayan calendar.

Elaborately carved human figures, with explanatory groups of glyphs, cover the fronts of the remaining stelæ upon this terrace.

The sculptured stone lintel of the doorway to this temple has an inscription of eighty-one characters upon the upper half of its face. Below this is a group of figures illustrating the return of successful warriors with prisoners and plunder. The priest wears an enormous headdress covered with short, stiff feathers, from the back of which spring five plumes of the sacred quetzal. A short tunic with sleeves covers the upper part of the body, and below this fall the embroidered sash-like ends of the breech-cloth. He wears elaborate sandals with heel-bands coming well up upon the ankle. Beads encircle his wrists and neck. He holds in his hand a spear-like staff of office ornamented with feather work. Before him kneel two warriors with spears in hand presenting a pile of plunder, and a naked prisoner bound with ropes.

North of this temple the ruins lie for the distance of nearly a mile and a quarter, the terraces and the larger pyramids being fairly well preserved. Most of the temples are in ruins.

One of the most interesting of these is built upon the terraced side of a natural elevation upon the eastern side of the plaza at about the center of the ancient city. Ten stelæ and three great altars stand upon the upper terrace of the pyramid and upon the plaza below.

Of the ten stelæ belonging to this temple, the one standing at the southern end of the building and called "stela twelve" by Mr. Maler is of the greatest interest. This has unfortunately fallen and is broken into four pieces. Each piece was photographed, however, and the prints fitted together, making a perfect picture.

The great stone altars scattered here and there in the plaza and in front of the temples consist of oblong or circular blocks with hieroglyphs and occasional groups of figures. The altars are raised upon stone pillars, which are often sculptured upon their outer faces with inscriptions or are cut into the form of grotesque heads.

These ruins differ in many respects from the other ruins of Central America and of Yucatan. Piedras Negras was evidently the seat of a powerful military chieftain, as the sculptures everywhere indicate. The sculptured groups and figures of the ruins of Yucatan and of Quirigua and Copan are almost wholly of a peaceful, religious character, indicating priestly power and a growth in culture and wealth by peaceful means.

M. Molesch, of Prague, recently read a paper before the Academy of Science of Vienna concerning phosphorescent bacteria, upon which he made a number of researches. He obtains a strong light by a collection of these bacteria and can even take photographs with it. When the bacteria are placed in a culture bouillon contained in flasks of one or two liters capacity, they form a "bacteric lamp" which gives a strong enough light to read a thermometer or see the dial of a watch at a distance of one or two yards. The experimenter thinks that such a bacteric lamp, as it gives no perceptible heat, will be of service in powder magazines and in scientific work. It can be also used under water to attract fish, as the flask can be hermetically sealed. When placed in suitable conditions, the bacteria possess the phosphorescent properties for several weeks.

CALLITYPY—A NEW WAY OF USING THE TYPEWRITER.

BY JACOB BACKES.

How the typewriter and photo-engraver can work hand in hand and perform all the work of the printer I have had occasion to set forth in two articles published in the SCIENTIFIC AMERICAN SUPPLEMENT. Briefly described, the method of doing away with typesetting consists in typewriting the matter to be printed, and in making line engravings therefrom which can be used as printing-plates. The possibilities of thus using typewriters were illustrated in the articles mentioned. It is the purpose of the present article to show the more recent improvements that have been made in "callityping," as this new way of using the typewriter is called.

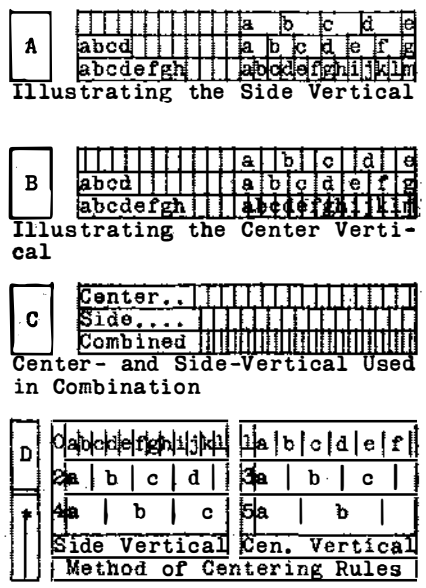

Illustration 1.—Callitype. Reduced From Original in Ordinary Typewriting Size.

In the SCIENTIFIC AMERICAN SUPPLEMENT for April 4 last were published specimens of callitypic composition in different sizes of type, in describing which the direction was given to use pen, ink, and ruler in making vertical lines. But in the practical application of this print-typing method it has since been proved that two different vertical marks, added to the machine's type equipment, and adjusted so as to strike at two certain points, relatively to the position of adjoining or adjacent alphabetic or numeral characters, give greater satisfaction and are more convenient and expeditious to use than lines made with pen and ink.

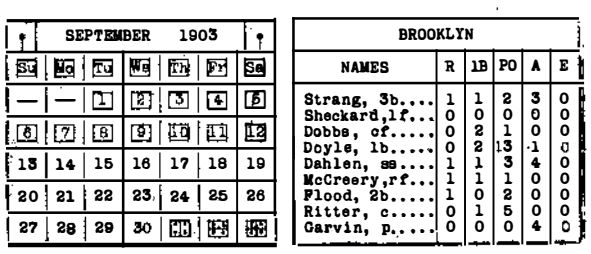
SEPTEMBER 1903
Su Mo Tu We Th Fr Sa
BROOKLYN
NAMES R 1B PO A E
Strang, 3b.... 1 1 2 3 0
Sheckard,lf... 0 0 0 0 0
Dobbs, cf..... 0 2 1 0 0
Doyle, 1b..... 0 2 13 1 0
Dahlen, ss.... 1 1 3 4 0
McCreery,rf... 1 1 1 0 0
Flood, 2b..... 1 0 2 0 0
Ritter, c..... 0 1 5 0 0
Garvin, p..... 0 0 0 4 0

Illustration 2.—Callitype. Reduced From Original in Ordinary Typewriting Size.

The four illustrations herewith constitute the first publication of what can be done by the use of such vertical liners in typewriting. These illustrations were callityped on one unchanged writing machine, and in no case was the paper touched with the hands, from the time it was inserted in the machine until the engraver's copy was finished, with the exception of center matter in Illustration 3, which was callityped on a separate sheet and inpasted, as were also the treble and bass clefs (clipped inpastings) in illustration 4.

Illustration 1.—*A.* The type for the side vertical is so engraved and positioned that it will strike at the left of the following character, and midway between that character and the one immediately preceding. *B.* The center vertical is centrally engraved and positioned, so as to strike between two characters, one space distant from each other. *C.* This is self-explanatory. *D.* Where letters or columns are an even number of spaces apart, a side vertical liner is used to secure midway position of perpendicular line; and where letters or columns are positioned an odd number of spaces apart, the center vertical is used.

In Illustration 4, *f* stands for *flat;* 1, whole note; 2, half note; 4, quarter note; 8, eighth note. As music notation recognizes no third or sixth notes, the figure 6 could be used as an abbreviation for a sixteenth, and 3 for a thirty-second, note. Symbolic corollaries are: *s* for *sharp*, *n* for *natural*, *r* for *rest*, etc., using small letters to show key, pitch, and time, and capitals for expression.

Side and center-verticals should begin and end on two consecutively typed underscores, and each vertical should be just long enough to type an unbroken vertical column when struck under each other. It is important that the paper feed of the machine be as exact as possible, so that the horizontal rulings made by the underscore can be depended on to be equidistant on all parts of the sheet. To test a machine for this, operators make vertical rows of close-lined parentheses, thus:

```
(((        (((        (((
(((        (((        (((
(((        (((        (((
```

at the middle and extreme margins of the sheet. These rows should have a longer perpendicular length than the circumference of the roller. All parts of the sheet should be closely examined for deviation from perpendicular equidistances between the ends of the parentheses.

In ink pad machines squares, rectangles, etc., are made by typing the left vertical from the upper left-hand corner down; then across; then up; then the carriage is shifted to first position, and a horizontal underscore left to right finishes. In making perpendicular lines the thumb of the left hand continuously holds down the space bar; another finger of same hand strikes the vertical-liner key; and right-hand fingers turn the roller by the knob for successive line changes of striking point. For ribbon machines this manipulation secures little or none of the necessary ribbon movement, therefore columnar lines are made downward only, governing the striking points of the vertical liner by proper settings of margin stop and ordinary use of the line-spacing lever.

The illustrations show the possibilities of the vertical liners in type composition. The original typewritings were photographically reduced to different sizes of characters, and any effect in any size can, of course, be as easily obtained in any other size. Ambitious tabulators, music composers, and draftsmen who use or have access to the writing machine should note that there is room for still further development and improvement.

What to printers is known as bordered, panele and rule-and-figure work — classes of expensive and exacting type-composition either outside the range or only conditionally within range in the operation of type-setting or line-casting machines — becomes, through the callitpyic operation of the writing machine, as facile and economical as ordinary composition.

The comparatively difficult and expensive kind of type-composition known as intersecting-rule and rule-and-figure work, which has always been a stumbling block to line-casting and type-setting machines, seems to be the destined particular field of callitypy, as in it such typing proceeds almost as rapidly as "straight" matter, could easily be done by the proficient operators of all writing machines, and type-high, ready-for-press callitypes (blocks) could be made from typewritten copy at 5 cents per square inch, in any size of type. In book and news work, nonpareil is the most favored size for the class of composition referred to, and it now costs 14 cents per square inch.

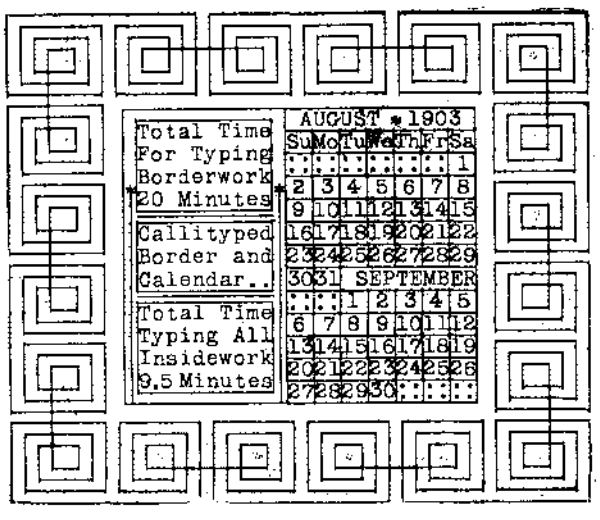
Total Time For Typing Borderwork 20 Minutes
Callityped Border and Calendar..
Total Time Typing All Insidework 9.5 Minutes
AUGUST 1903
SEPTEMBER

Illustration 3.—Callitype. Reduced From Original in Ordinary Typewriting Size.

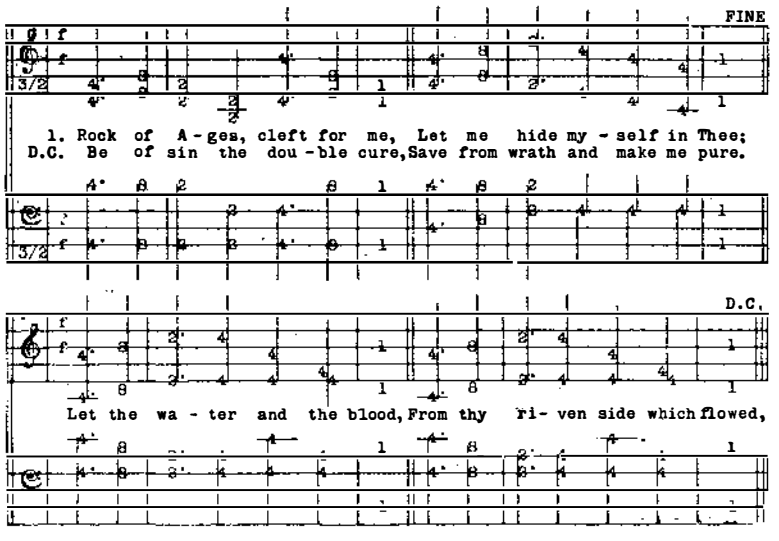
FINE
1. Rock of A-ges, cleft for me, Let me hide my-self in Thee;
D.C. Be of sin the dou-ble cure, Save from wrath and make me pure.
D.C.
Let the wa-ter and the blood, From thy ri-ven side which flowed,

Illustration 4.—Callitype Reduced From Original in Ordinary Typewriting Size.

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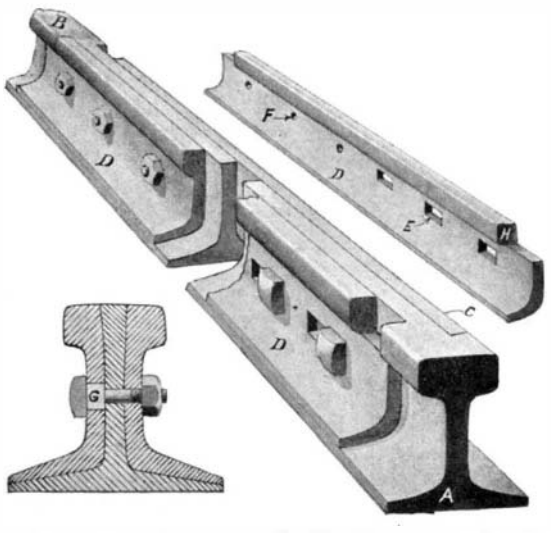
Patent Department

A Trick With the Telephone.

It is not generally known to users of the telephone,—and perhaps it is just as well for the interests of the service—that when the ear-piece of a receiver is held to the mouth-piece of the transmiter a more or less shrill tone or whistle is heard in the receiver. This occurs when the apparatus is in good working condition and when the transmitter is on short circuit. This effect is seemingly due to a series of reactions analogous to, but much more complex than, those which occur in an electric bell when its circuit is closed. A movement of the diaphragm of the receiver toward its magnet tends to weaken the pressure on the carbon of the transmitter, which causes a weakening of the current, allowing the diaphragm to fall away, with the further result that the air column is compressed, increasing the pressure on the carbon again, and also increasing current strength, whereby the diaphragm is again attracted, and this action is repeated over and over again. Recent investigation of these phenomena indicates, as might be anticipated, that it is dependent upon the fundamental rate of vibration of the receiver and transmitter, the length of the air column inclosed between them, and also the oscillation period of the circuit. The above references to the attraction of the diaphragm and to its falling away are, perhaps, rather broad terms, when it is considered that as near as can be calculated the amplitude of vibration of the diaphragm of the receiver in reproducing speech is about the one twenty-millionth of an inch.—Cassier's Magazine.

IMPROVED RAIL JOINT.

To securely connect together the rails of a railway, and at the same time allow sufficient freedom for expansion and contraction under variations of temperature, is no small problem, as proved by the numbers of patents on rail-joints which are being continually granted to inventors. Mr. Paul Jason Lukes, of Balls Ferry, Cal., has offered a good solution of the difficulty in a recent invention. His invention, in addition to fulfilling the above-mentioned requirements, provides a continuous-tread surface for the car wheel, thereby preventing wear and pounding at the joints. Our illustration shows two rails, *A* and *B*, joined together by Mr. Lukes' improved connection. It will be observed that the ball of each rail is cut away at the sides for a short section adjacent to the ends of the rail, leaving only the center web along the tread of the rail. The rails are connected by fish-plates *C* and *D*, which are formed to fit snugly against the sides of the rails. The fish-plates are formed with tread surfaces adapted to fit into the cut-out portions of the rail treads. The fish-plate *C* is secured by bolts to rail *A* and fish-plate *D* is similarly fastened to the rail *B*. At one end the fishplates are provided with slots *E* and at the other end boltholes are formed. The bolts which fasten the plates to the rails are provided with squared portions, *G*, adapted to fit into the

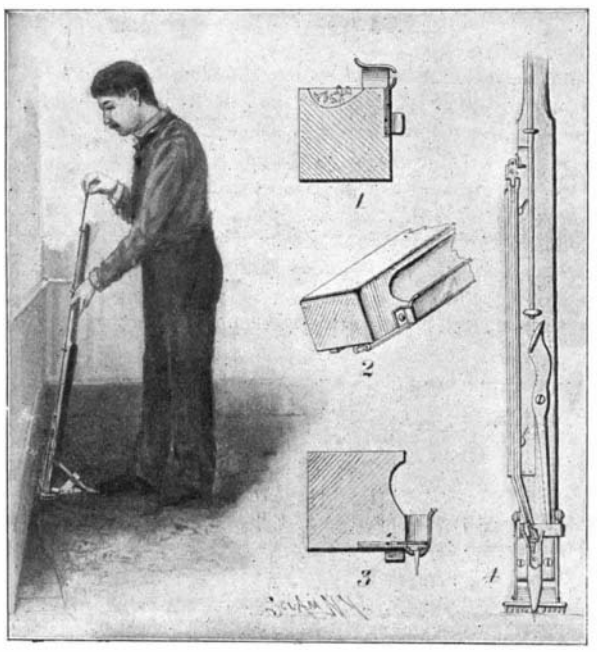


RAIL JOINT WITH CONTINUOUS-TREAD SURFACE.

slots of one of the fish-plates, while the main shanks extend through the rail web and the fish-plate on the opposite side, where they are secured by nuts. In this way the fish-plate securely fastened to one rail has a sliding connection with the other, and *vice versa*. The treads of the fish-plates are cut away at *H* so as not to interfere with the longitudinal movement of the rails. The tread at the joint, however, is practically continuous, for there is always at least two-thirds of the tread surface for the car wheels to run on.

COMBINED CARPET STRETCHER AND TACKER.

We illustrate herewith a device which will be found very useful in the household. It is the invention of Mr. J. W. Quilling, of Ursa, Ill., and consists of a carpet stretcher provided with a reservoir for carpet tacks and means for feeding them singly to the carpet and driving them in. The advantages of such a device will be apparent to all who have ever laid carpets. Our illustrations show several detail views of the invention, which will enable our readers to understand its construction. It comprises a long hand-lever pivotally



A COMBINED CARPET STRETCHER AND TACKER.

connected with a foot-piece at its lower end. The foot-pieces is provided with teeth adapted to engage the carpet, and is also notched at its forward end. A hammer rod is held in guides on the hand lever, and is adapted to drive the tacks as they are fed into a toe-piece which projects into the notch of the foot-piece. The tack reservoir consists of a guideway which holds the heads of the tacks, their points being allowed to project outward through a slot. They are prevented from dropping into the toe-piece by a slide which closes the lower end of the guideway. The guideway is opened automatically by means of a lever which is moved on operating the hammer rod. This permits a single tack to fall down into the toe-piece, the head striking a lug which causes it to turn point downward. A spring on the toe-piece prevents it from passing through until forced down by the hammer. The tack reservoir may be loaded by inserting the tacks singly at the upper end. A more rapid method is as follows: On the side of the hand lever, just back of the guideway, as shown in our detail views, is a trough. The hand lever is held horizontally, and the tacks are put into this trough. The device is then turned on its side, as shown in Fig. 2, whereupon the tacks slide into the guideway, point downward. They are then secured by a plate which slides in behind the tack heads. This plate may be seen in Fig. 4, secured to the main lever by screws passing through diagonal slots. A spring catch holds this slide in place. The carpet stretcher may be used in the usual manner, and the tacks driven in while holding the carpet stretched. The foot-piece can be folded up against the hand lever when the device is not in use, a catch being provided for holding it in this position.

New Law of Importance to Owners of Canadian Patents.

A very important amendment has been made in the Canadian Patent Act, which relieves the unsatisfactory situation which was occasioned by the recent decision of the Canadian Supreme Court, which held that the Canadian Commissioner of Patents is authorized to grant only one extension of manufacturing time, and that the provisions for the manufacture of the invention in Canada should be strictly complied with. The new law makes it optional with a Canadian patentee either to comply with the manufacturing provisions of the Canadian Patent Act, which requires the patent to be worked in that country within two years, or to file a petition requesting that the Canadian Commissioner of Patents order that the patent be subject to the compulsory license provisions of the amended law, in lieu of a compliance with the manufacturing provisions.

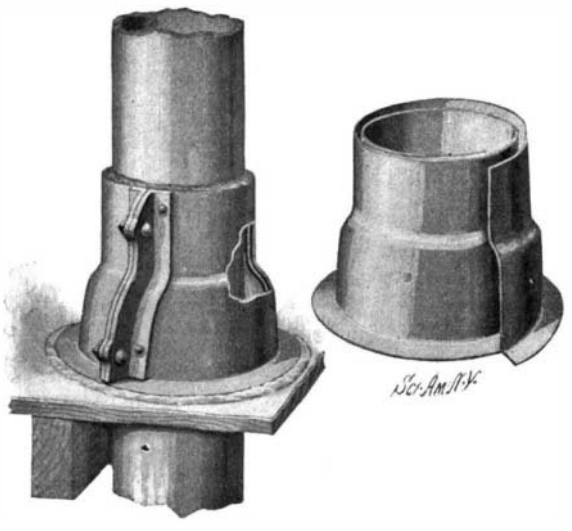
Where patents are subject to the compulsory license law, it will be unnecessary for the patentee to commence the Canadian manufacture within any stated period; but should another person show that the Canadian manufacture is not sufficient to supply the Canadian demands, and should such person apply for a compulsory license, the license will have to be granted for a consideration, which will be determined by assessors appointed by the Commissioner of Patents. In cases where the patentee has filed the petition and he finds it convenient to commence the Canadian manufacture at an early date, he will not be obliged to grant licenses, for an applicant for a license will be unable to show that the Canadian demands remain unsatisfied; and it will only be in cases where the patentee, for some reason or other, has not commenced the Canadian manufacture, that he may be called on to grant a license. When a license is ordered to be granted, the patentee will receive a valuable consideration, and as the licensee will not compete with any business which the patentee has commenced, it would in any case be to his interest to grant the license. The license laws, therefore, will do much to enable patentees to introduce their inventions, by bringing patentees and possible licensees together, and the value of Canadian patents which are subject to the license law will be greatly increased.

Canadian patents which were void under the old law by reason of the failure of the patentee to manufacture the patented goods in Canada before the expiration of the first two years of the term of the Canadian patent, or within a single extension of manufacturing time, may be revived, provided the patentee before February 13, 1904, either commences the *bona fide* manufacture of the invention in Canada or files his petition requesting that the patent be subject to the license law. Every holder of a Canadian patent on an invention, which is not being manufactured in Canada, should therefore at once petition the Commissioner of Patents, in order to avoid being compelled to manufacture before any stated period. The holders of Canadian patents which may be hereafter issued have six months after the grant of the patent in which to file the petition.

The Canadian Patent Act is also amended so that a Canadian patent will not expire because of the expiration of a previously granted patent in another country. The amendment also contains provisions which save the rights of third persons whose rights may have been obtained under decisions construing the old law, and of persons who have commenced the manufacture of the invention in Canada between the date when a patent would have been held to have expired under the old law and the date when the new law went into effect.

FASTENING DEVICE FOR VENT PIPES.

A new form of fastening device for vent pipes has been invented by Mr. John J. Meyer, of 23 East 135th Street, New York city. The device possesses the advantage of being effective and reliable in use, and at the same time of being comparatively inexpensive to manufacture. It can be very easily applied and removed, and when applied will insure a perfect air and water-tight joint, capable of withstanding thermal changes and inclement conditions. The device is made preferably of sheet zinc, consisting of a band of the metal adapted to be coiled snugly about the vent pipe. As usually made it is formed with a straight upper portion to fit the sides of the pipe, and a flaring base portion setting out some distance from the sides of the pipe. In order to secure the device to the pipe, an angle piece is riveted to the outer end of the sheet metal coil. A similar angle piece is secured to the



FASTENING DEVICE FOR VENT PIPES.

coil in such position that when the coil is tightly wound around the pipe, the two angle pieces will nearly meet and can be drawn firmly together by means of bolts. The lower edge of the coil is preferably provided with a flange, which establishes a firmer seating of the device in place, and facilitates the application of solder to secure it to the metal covering of the roof. Previous to clamping the device onto the pipe, cement is poured in between the coils, and then after the parts are tightly drawn together, a most secure and stable support for the structure will be had.

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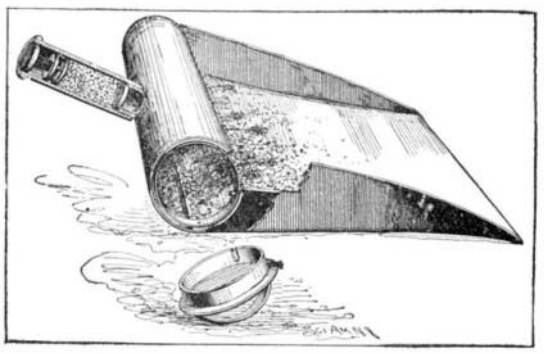
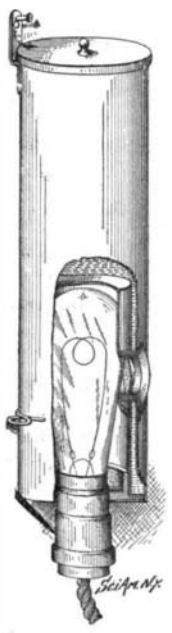
ODDITIES IN INVENTION.

IMPROVED DUST-PAN.—A Philadelphian has invented a dust-pan which differs from the ordinary type in having a receptacle in which the sweepings may be temporarily stored and from which they may be conveniently discharged when desired. This prevents scattering of the dust around the room as the pan is carried from place to place. The receptacle is located at the rear end of the pan and has the form of a cylinder with two slots or openings, one leading into an auxiliary chamber below the pan proper, and the other lying at the top of the incline of the pan. These are adapted to be covered by a pair of gates which may



IMPROVED DUST-PAN.

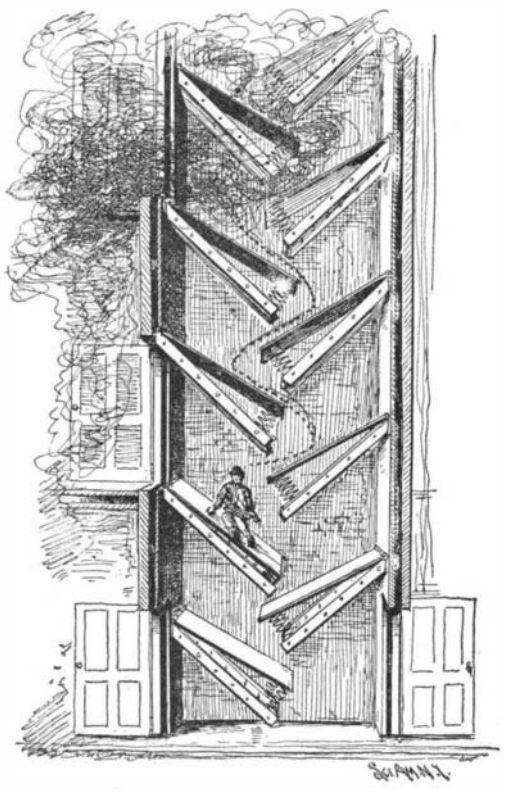
be swung to open or closed position by a turn of the handle at the end of the receptacle. When using the pan the upper slot is uncovered and the dirt is swept up into the receptacle. On closing this opening, the other is uncovered and the dirt may enter the auxiliary chamber. A cap at the end of the receptacle may be removed to permit emptying the pan. The handle of the pan is provided with a disinfectant which, by means of a plunger, may be forced into the receptacle to disinfect the accumulated dirt.



MILK-WARMER AND NIGHT-LAMP.

NURSERY MILK-WARMER AND NIGHT-LAMP.—A New York inventor has hit upon the idea of utilizing the heat of the nursery night-lamp for warming baby's milk. The device comprises a vessel for containing the milk, having at its lower end an inner chamber adapted to receive an incandescent electric lamp. The lamp is held in place by a bottom plug thereon, which fits snugly into the chamber. Light from this lamp is shed through an opening in the walls of the vessel. A double-convex lens is here situated to diffuse and soften the light. The device is adapted to be hung from a nail in the wall, but is held out of contact with the wall by a bend in the hanger piece and a double loop of wire soldered near its lower end. The safety, convenience, and economy of this device are readily apparent.

NOVEL FIRE-ESCAPE.—Something decidedly unique in fire-escapes is here illustrated. It is the invention of Mr. P. H. Dedrick, of Grand View-on-Hudson, New York. The device comprises a series of spring platforms so arranged that a person may slide down from one platform to another until he reaches the ground. The fire escape is located in the shaft or well of a building, and this shaft is provided with yielding walls from which the platforms are hung. Obviously, from the illustration, the fire escape is accessible from any floor of the building, and since the platforms overlap each other, there is no danger of falling between them directly to the ground. Instead, the unfortunate individual who, driven by desperation, trusts himself to this fire escape, will slide and bounce from one spring platform to another with increasing momentum until he reaches the bottom of the shaft.



NOVEL FIRE ESCAPE.

Brief Notes Concerning Inventions.

There seems to be a craze for things wireless. The latest addition to this line is a wireless armature, which has been invented by Roy Snedegar, living near Owingsville, Ky. A company has been formed to promote his invention.

Mrs. J. Mitchell Clarke, of Fifth Avenue, New York, whose invention of a resounding piano lid has already been referred to in these columns, recently received a patent on the invention. It is a convex lid which fits over the piano in place of the ordinary lid, and is applied to a grand, square, or upright instrument, but its function is best filled on a grand piano.

Charles D. Rodgers, the director and general superintendent of the American Screw Company, of Providence, died during the latter part of May at his home in that city. He had been in the screw-manufacturing business for thirty-five years, and being possessed of rare inventive ability, was the patentee of a great many inventions and improvements which have been made during that time in the manufacture of screw-making machinery. Mr. Rodgers was 76 years of age.

A cablegram says that a poor watchmaker named Fritz, of Berlin, has recently been made immensely wealthy by the invention and sale of a mechanical time-fuse for projectiles. The arrangement made by him with the Krupp company called for a cash payment of $50,000 and a royalty of one mark (a trifle over 20 cents) for each one of the fuses made by them. The French, English, and American rights have also been disposed of recently. The fuse is said to be capable of the most delicate adjustment.

Garabed G. Heghinian, an employe of the Bureau of Highways of the Borough of Brooklyn, is the inventor of an automatic level rod, by which surveying is done with very much less work and computation than heretofore. The ordinary additions and subtractions involved in leveling are dispensed with entirely, since by proper setting of the rod, cuts, fills, and elevations are read direct; that is, the rod reading itself is the cut, fill, or elevation. Not only are errors reduced to a minimum, since there is no chance of errors of calculation, but the field work is greatly reduced.

Hans Neimend, of Ida Grove, Iowa, has invented a device operating on slot machine principles, with the device serving to take the place of the time-honored custom of passing the collection box in church. The apparatus consists essentially of an air compressor, which is to be placed in the basement or some other place convenient to the church where it is to operate. From the air compressor pipes will be run to each seat in the various pews, the seats being upholstered with individual pneumatic cushions, and each one provided with a slot machine device, the insertion of a coin in which will permit air from the compressor to inflate the pneumatic cushion to a limited extent. It is evident that the more coins inserted, the more inflation of the cushion, and consequently more comfort for the occupant of the pew.

A Catholic priest of Gardenville, Md., has patented a device designed for the protection of parishioners from accidents which sometimes happen from the use of candles at the celebration of the feast of St. Blasius. This occasion takes place early in February, when the saint is invoked on behalf of many devoted church people, that they may be freed from throat troubles of various kinds. The ceremony is performed by crossing two blessed candles and holding them lighted at the throat of the parishioner while a prayer is offered. The reverend father's invention consists of a shield, by which the hair is protected from the flame of the candles and the clothing from the falling candle grease. A number of these have been made for use, and have been used in different churches, and a company has now been formed for the purpose of making them in large quantities for general use.

An old man living at Alto Pass, Ill., named Eastman, claims to be the inventor of the pilot as it is now used on the front of the American locomotive. The Mad River and Erie Railroad was the first in Ohio, and he was one of the builders of it. The first engines supplied to that line had an arrangement of iron rods fitted on the front, which picked up an animal which might be in the way of its passage and carried it along. This was not satisfactory, and after this the "cow bumper" was devised, which led to endless trouble. Eastman heard some one say once that what was wanted was a device which would push or throw an animal to one side when struck, and he designed the pilot as it is now in use all over this country, and which was found to be satisfactory as soon as it was tried on the line which he was then working for. The pilot was, according to his account, never patented, and he never received any direct substantial benefit from the thing.

Frederick Sedgewick, formerly of Elgin, Ill., is the inventor of a cipher code typewriting machine by which it is possible to put a communication in cipher which will defy solution except by some one supplied with the proper facilities for doing so. This device was offered for patent some time ago, when it was at once opposed by George C. Blickensderfer, who claimed that it was an infringement on the patent which he already held. The usual time allowed to make out a case in such instances expired without any further effort on the part of Mr. Blickensderfer, and in all probability the patent will be granted. An ordinary message transcribed by this machine, which has a keyboard in many respects the same as a typewriter, issues forth a jumbled mass of letters, but the usual methods of unraveling a cipher message are defied. This is accomplished by an automatic device which changes the relationship of the keyboard and the letters at irregular intervals. In this way no one character is in use more than another, and no clew whatever is given for anyone receiving the message surreptitiously to decipher it, and the only way in which this can be done is by copying the message in another machine which has been adjusted to correspond with the one on which the original message was written. This implement has been called to the attention of the proper government authorities, and it is probable that it will be adopted for use in the army and navy. Senator Mason and Congressman Hopkins are said to be using their influence in this direction.

There was recently exhibited at the Franklin Institute, in Philadelphia, by Frank A. Brunner, of that city, a means of making photographs on papers of the ordinary slow-printing kind used by all professional photographers, without regard to the weather. The business of the professional photographer has been heretofore very largely dependent on the sun. A few days of rainy weather throws his business back just that long, as he is unable to make prints without the aid of the sun. With the machine referred to, it is possible not only to make the prints at all times, but to do the work in half the time usually required. The invention embraces two features, one in the construction of the lamp giving a light very rich in the violet rays, and which have by far the greatest chemical action, and the other in the construction of a frame, by which the plates are held around the light at the point where they receive the greatest and most diffused illumination. The machine is octagonal, occupying a floor space of about three by three feet, and each one of the spaces will accommodate a printing frame 11 by 14 inches, or a greater number of smaller ones. The daily capacity of the machine is about 800 or 900 prints, 5 by 7 inches. In the demonstration given, a print of a negative of a very dense character, which the operator said required thirty minutes to print by bright sunlight, was made in sixteen minutes, while prints of a normal density were readily made in much less time. The machine is designed for the use of all commercial photographers, and is made in three sizes to meet all demands.

Few persons contemplating the line of homely telegraph poles standing along a road or highway, realize the amount of money there is invested in these tall sticks of wood. Each one of these represents an expenditure of from twenty-five to one hundred dollars, and occasionally, in the instances of the very large ones sometimes required, the cost overtops the maximum mentioned. Any scheme which will tend to prolong the lives of these poles will be welcomed by the telegraph and telephone companies. One of the greatest sources of annoyance to the companies is the tendency of the poles to deteriorate at a point where they enter the ground, by reason of the rotting of the timber caused by the moisture from the earth. If the pole is not removed in time it will fall, and sometimes carry with it a number of neighboring poles, which have also become more or less weakened at the foot. The poles thus damaged are unfit for further service, but a means of making use of such poles has been devised in the resorting to a foot or butt of cement. These are made in different thicknesses about five feet long, and when used on new poles permit of the purchase of poles five feet shorter than would be otherwise required. One of the greatest advantages, however, is the fact that a weakened pole can be set on a strong leg and given a new existence without the necessity of disturbing the overhead work. This is accomplished by cutting the pole at the ground and slipping a new cement butt in the hole where the wooden end formerly rested. This same scheme is resorted to in the construction of fencing, the cement slabs being used for the support of the posts.

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Legal Notes.

TWO DESIGN PATENTS CONSTRUED.—Suit was brought by Christopher C. Bradley against Richard Eccles (Bradley vs. Eccles, 122 Fed. Rep. 87) for the alleged infringement of two design patents issued to the complainant and owned by him. One design patent covered thill couplings, the other a washer for thill couplings. The former was granted on May 29, 1900, the later on May 10, 1898.

Section 4929 of the Revised Statutes in force at the time of the commencement read as follows:

"Any person who, by his own industry, genius, efforts, and expense, has invented and produced any new and original design for a manufacture, bust, statue, alto-relievo, or bass-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, patent, print, or picture to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known or used by others before his invention or production thereof, or patented or described in any printed publication, may, upon payment of the fee prescribed, and other due proceedings had the same as in cases of inventions or discoveries, obtain a patent therefor."

Both of Mr. Bradley's patents were taken out for designs for a manufactured product and purport to be new and original designs for a manufacture, and new, useful, and original shapes or configuration of articles of manufacture, and that they were not known or used by others before their invention or production.

The court thought that a thill coupling is a manufacture, and that a washer for a thill coupling is a manufacture could not be successfully denied; and that a new and original design for such a manufacture was within the statute. While the patent granted under this section was for the design of a manufacture or article, such design was not rendered unpatentable, or placed without the statute, for the reason that the article of manufacture to which the design related, and which was manufactured according to the design, was an article of use in some branch of industry.

In the opinion of the court, it mattered little whether the new and original design, or new, useful, and original shape or configuration, of an article of manufacture, is applied to ornamental wall paper, pictures, or any other manufacture intended simply for ornament, or to the picture frame intended to hold the picture in place, or to a window intended to light a house or church, or to a plow or hammer used in agricultural and industrial pursuits. All are equally within the statute, and were intended to be.

"The carpenter who sings while he swings his hammer admires the design of the instrument he is wielding; that is, the appearance presented to his eye and created by imposing on the physical substances constituting that instrument a design which gives to his hammer some peculiar shape or ornamentation that makes it pleasing to his eye. The plowboy who whistles as he follows in the new-turned furrow admires and is impressed by the design of the plow that turns the sod, which is nothing more or less than the appearance presented to the eye and created by imposing on physical substances making the plow some peculiar shape or ornamentation."

"Nor can it matter," in the judgment of the court, "that the new and original design for a manufacture, or the new, useful, and original shape or configuration of the article of manufacture is designed for use in some obscure place. Primarily, it comes from the hands of the manufacturer, and is placed upon the shelves of the shopkeepers for sale, whence it passes into the hands of purchasers and users, and so is observed, and, if of a new and beautiful design, admired, not only by all patrons of the shop where kept for sale, and by all would-be purchasers, but by all who use the article thereafter, or observe it while in use. Common experience teaches that the element of beauty or tasteful construction adds largely to the salability, and hence to the value, of the most common articles in use by the human family. A harness is used upon a horse for the purpose of attaching to such animal the vehicle in which the driver is to be seated, and, so far as mere use is concerned, it matters little as to the design of the harness, but who would think of denying that the harness beautifully designed is within the statute? Who would think of denying that a new, useful, and beautiful design for a buggy is not within the statute? If this be true, then each and every part of such vehicle, if handsomely designed, ought to be and must be within the statute. This court is of the opinion and holds that the thill coupling is an appropriate subject for a design patent. This court is also of the opinion that a washer for thill couplings is also an appropriate subject for a design patent. Both are articles of manufacture, and, while designed for sale and use, it is important to the manufacturer and merchant that the design be pleasing to the eye and ornamental; and it is also important to the user of the vehicle to which they are attached that the design be ornamental. The expense of carriages for pleasure riding is probably double because of the use of designs purely ornamental to the carriage. Carriages are painted in various designs, and this painting is intended to be ornamental. Would not a new and ornamental design for painting a wagon be within the statute? The painting is useful as well as ornamental, but double the money is frequently paid for ornamental painting, where the utility is not added to in any degree. The complainant's design patent for his thill coupling is new, taken as a whole, and in its design is ornamental to the carriage and pleasing to the eye, in and of itself. Both singly and in combination with the carriage it is new, useful, and ornamental. Hanging by itself upon the wall of a house, it would not be ornamental as part of the house; but, hanging by itself as an article of manufacture for use as part of a carriage, it is ornamental, and at once attracts the attention and excites the admiration of all who love and admire beautiful vehicles."

The court did not hold that a patent must be ornamental in the ordinary sense in which that word is used; that is, that it must be an ornament in a parlor or room of a house or an ornament solely upon a vehicle with which it is used, or ornamental if worn by a person. The court was of the opinion that the statute, even as amended May 9, 1902, means that "the design or form for the article of manufacture is to be such that it is ornamental when offered for sale in the market, if designed for sale in the market, or ornamental in the place where used, and that the statute is satisfied if it be ornamental in either place. If a design patent for a washer for thill coupling looks fine and handsome (that is, ornamental), and if it produces this effect upon the eyes of those who desire to purchase and use such an article of manufacture, and upon all who observe it, and, when observed, produces pleasant emotions in one who has an understanding of and an eye for a thing of beauty, which is a joy forever, whether it be useful or non-useful, because of the design, then it is within the statute and patentable."

The court tersely said that complainant's device for a washer for thill couplings answered these conditions. "No one in a civilized community would think of using a string of them for a necklace. They are not designed to be ornamental in that sense. They would be ornamental, properly strung and hung in a carriage factory, carriage house, or stable. The form in which this washer for a thill coupling is made adds or lends beauty and attractiveness to itself; that is, to the washer. In other words, its design is such that the washer itself, ordinarily not pleasing, or at least not attractive, to the eye, is made a handsome and attractive thing in the eye of all who have a taste for vehicles and their attachments. This washer is not intended as a decoration, but may in places be used as such, and, aside from its usefulness, might add beauty, grace, or attractiveness to the places in which kept for sale or use, or in which carriages are kept for sale or use. The design is such that an unattractive article of manufacture is made beautiful and attractive to the dealer, the trade, and the user, and those who see it in use. It is not intended for exhibition as a mere ornament when completed according to the design, but is intended to be ornamental in its sphere of usefulness, and attractive and pleasing to the senses of all observers, and may be used in the places mentioned as an ornament."

It was held that both these patents were unanticipated, valid, and infringed.

A SLATE-PICKER PATENT CONSTRUED.—Two patents were issued in 1888 and 1893 to Septimus Thomas for what is known as a slate-picker, or device for mechanically separating and removing slate and other impurities from coal. These patents were made the basis of a suit of Thomas vs. Spencer (122 Fed. Rep. 877).

The court said that the general principle made use of is the greater weight, and consequently slower motion, of the slate as it passes along with the coal down and over certain chutes or planes of different materials differently inclined, which are so constructed and arranged that the slate is induced to drop into an opening near the end, while the coal leaps over it and goes on. There is nothing particularly new in this, the same idea having been similarly made use of in several preceding structures, including two patented to the same inventor, one in 1875 and the other in 1878. The patents in suit depended for their novelty and validity, not on new features previously used, but on a particular combination of them devised by the inventor to produce the result in mind. The alleged infringement was also to be judged in the same way. The question was not whether the machines constructed by the defendants had anything in common with the patents in suit, but whether they employed the same combination of elements in substantially the same way to effect the same result.

The court said that the mistake plaintiff made consisted in supposing that the adaptation of any element of the patents constituted an infringement, however old such development may be, and without regard to the combination in which it figures.

"The defendants make use, for instance, of a feeder, and they also employ a stone slab as a deflector plate near the end of the chute. But it by no means follows that either of these is an infringing use—both of these devices being old—simply because they are found in the patents in suit. No doubt, in general effect, a rocking or rotary feed, such as those in the defendants' machine, is the equivalent of the reciprocating vertical feed employed by the plaintiff, however much it may improve thereon. But a reciprocating feed actuated by an eccentric in exactly the same fashion as now is an element of the Thomas ore separator, patented in 1878, and was adopted again by express reference in that of 1888, so that when the earlier of these ran out, as it did in 1895, as a device it was open to every one, and the defendants were at perfect liberty to make use of it as they have. The same is true with regard to the slab of slate or stone, of which much seems to have been made. Assuming that the use of a mere material could be so monopolized, which is at least debatable, it is specified as appropriate in such a structure in both of the Thomas patents, which have just been alluded to; so that, if ever otherwise, it certainly now is free. The adjustable opening at the foot of the lower chute stands in exactly the same situation. As to both the patents in suit, therefore, these three things were all old, and no just complaint can be made with regard to the use of either of them as single, independent features in the defendants' machines."

The court held that the claims were not infringed.

AN INTERESTING TRADE MARK DECISION.—In the case of Uri vs. Hirsch (123 Fed. Rep. 568), it appeared that a bill was filed by the complainant for the infringement of an alleged trade mark, the complainant asserting that since the 15th day of April, 1892, he was engaged in compounding and selling liquors variously labeled "R. H. Parker Rye," "R. H. Parker Whiskey," "Parker Rye," "Old Park Rye," and "Parker Bourbon." In these names a common law copyright and trade mark was claimed. The bill tendered directly the issue that the defendant's use of the name "Parker" originated in the fraudulent purpose to reap benefit from the reputation of complainant's whiskies, with the allegation that the defendants for a long time had been so engaged. The defendants asserted that they had been engaged since 1879 in the handling, compounding, and selling of liquors in Colorado, in which State they had marked packages of liquor with the name "Old Parker."

The court stated that if it be conceded that the names employed by the defendants designating their whiskies "possessed no special significance as indicating a grade and qualities of goods of class and kind," this would not show such appropriation of the name "Old Parker" as would establish in the defendants a trade mark right. It appeared from the evidence that the only sales known by complainant to have been made by the defendants were two barrels, early in 1901, under the style of "Old Parker." The testimony of the purchaser shows that he understood in making these purchases that the liquor was not from the complainant's house. The court strongly intimated that the complainant's pleading was characterized by utter recklessness of allegation. The trade mark had been published and recorded in the Fifth Kentucky District of Internal Revenue, Nelson County. Many exhibits were produced which showed how conspicuously he had advertised his products.

The court denied the prayer for injunction and dismissed the bill, since it could not be shown that the defendant had fraudulently endeavored to injure the complainant's business.

SMOKELESS POWDER PATENT CONSTRUED.—Letters patent were granted June 3, 1890, to Richard von Freeden, for a process for making smokeless gunpowder from nitro-cellulose. The process consisted, first, in completely dissolving the nitro-cellulose by a solvent, and, after it is kneaded or rolled into a plastic mass, in adding a "liquid or vapor chemically indifferent to the constituents of the mass," preferably water or steam, and swelling until complete granulation has been produced. Suit was brought against Dupont de Nemours & Co. by Wolff (122 Fed. Rep., 944), in which an infringement of this patent was claimed. In the Dupont process finely divided nitro-cellulose is distributed uniformly by means of stirring throughout the body of the water or liquid which holds it in suspension. The solvent is then added and the stirring continued, by which means gelatinization or granulation are simultaneously effected. The court entertained some doubt as to the sufficiency of the description of the Von Freeden patent. It held, however, if the patent be not invalid because it does not specify the quantity of water or steam required to produce granulation, it is not infringed by the Dupont process.

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RECENTLY PATENTED INVENTIONS.

Electrical Devices.

DROP-SWITCH FOR TELEPHONES.—G. L. GULLIFORD, Bloomington, Ill. In Mr. Gulliford's patent the invention has reference to telephony, and the more particular object of the improvement is the provision of a neat, efficient, and reliable form of drop-switch constituting a relaying mechanism for actuating an alarm at a distance from the telephone.

SUPPORT FOR TELEPHONE-RECEIVERS.—E. BASS, New York, N. Y. The purpose of the invention is to provide a support for telephone-receivers which will be simple, durable, efficient, and economic, independent of the telephone back and its appurtenances, and which can be quickly and conveniently applied to a wall or other support adjacent to the telephone-box without unnecessarily marring the support.

TIME-CONTROLLED ELECTRIC ALARM.—A. L. RONELL, Humboldt, Iowa. The invention in the present case relates to a time-controlled electric alarm admitting of general use and of special utility in relation to schools, railway-depots, hotels, and all other institutions in which it is desirable to sound an alarm periodically.

TELEPHONE TEST INSTRUMENT.—H. G. CHALKLEY, New York, N. Y. This improvement refers to test instruments of the kind more particularly used in detecting trouble upon telephone-wires. In operation the purpose is to provide means for dividing the current so as to enable the instrument to work with either a live wire or a dead wire. In other words, the object is to send the current through the magnet for the purpose of actuating a diaphragm and through the comminuted carbon for the purpose of enabling the voice to effect it by means of the carbon. When the instrument is used as a receiver, the magnet-coils are energized from a distance.

Engineering Improvements.

BOILER.—M. F. KENELY, Elizabeth, N. J. The aim of this invention is to provide certain new and useful improvements in boilers whereby the water is quickly heated, a rapid circulation of the water is effected, and the front of the boiler is protected against the intense heat emanating from the burning fuel in the fire-box.

DEEP-WELL PUMP.—N. A. HEYMAN, Los Angeles, Cal. In carrying out the present invention, Mr. Heyman has particularly in view the construction of an apparatus through the medium of which a steady regular flow of water from a well or mine will be maintained, such apparatus also embodying the essential and desired features of simplicity and durability. The improvement has particular relation to a pump for raising water from deep wells, mines, or the like by means of compressed air.

MANHOLE-COVER.—J. J. IRVINE, Pittsburg, Pa. In this case an object in view is the provision of means for supporting a manhead within a boiler in an open position when it is desired to clean out the interior thereof, such holding means enabling the manhead to be easily and accurately returned to its seat against the boiler in a manner to secure a tight joint between the parts and overcome any tendency to leak when the boiler is again used.

MEANS FOR FEEDING FUEL TO FURNACES.—R. W. GROVE, Lewistown, Mont. One object Mr. Grove has in view is the provision of simple and efficient means for feeding solid fuel, such as coal, into the furnace in a way to minimize manual labor and the admission of cold air to the combustion or grate chamber. A further object is to equip the fuel-feeding mechanism with means for distributing the incoming fuel over the fire-box and the bed of incandescent fuel therein, such distribution being regulated to direct the same toward one side or the other of the grate-chamber or into the middle portion thereof.

Heating and Ventilating.

GAS-HEATER.—J. R. TYSON, Reading, Pa. This invention refers to improvements in heaters of that kind which are especially designed for use on gas-fixtures to utilize the flame resulting from the combustion of gas as a means for heating and ventilating rooms or apartments. The heater is simple and compact in construction and adapted to be easily slipped into place on a common gas-jet.

HOT-AIR REGISTER.—S. TUTTLE, New York, N. Y. An object claimed by this inventor is to secure an enlarged opening from a lower room to an upper by projecting the register some distance into the room, thus allowing a portion of the floor to be cut out for a larger pipe than can be passed up through the ordinary partition. Another object is to control the air delivered by directing it wholly, partly, or not at all into either the lower or upper room.

Hardware.

SAW-SET.—P. H. L. KLETTE, Bates, Cal. The object in this case is to provide a new and improved saw-set which is simple and durable in construction, easily manipulated, positive in operation, and arranged to bring the point of the saw-tooth in contact with the plunger previous to moving the latter to set the tooth.

NUT-LOCK.—J. V. BERRY, Shamokin, Pa. In this patent the invention refers to an improvement in screws and nuts, and more particularly to the subclass known as "nut" and "bolt" locks. The object is to furnish a ready and efficient means of securing in any desired position nuts to bolts in such a manner that the nuts may not become loosened by jarring or by any turning of the bolts or other parts to which they are attached.

Lighting and Heating.

HEATING-STOVE.—C. MATTHEWS, Columbia, Mo. Broadly stated, the invention resides in a peculiar casting involving novel details of construction whereby increased heating-surface is provided. More definitely stated, it consists in the casting formed by upper and lower members, of which the former constitutes the fire-bowl and the latter the ash-pit.

OIL-BURNER.—C. W. SIEVERT, Los Angeles, Cal. This invention relates to an oil-burner constituting to some extent an improvement over a prior patent of Mr. Sievert. The object of the present invention is to effect a more thorough and uniform vaporization and consequent combustion of the oil and also to enable the burner to be placed in any position and supplied with oil in company with a relatively thin stream of water, which effects thorough atomization of the oil and also when heated assists in transforming it into vapor.

Machines and Mechanical Devices.

AUTOMATIC DEVICE FOR OPERATING HATCH-COVERS FOR ELEVATORS.—S. E. AUSTIN, New York, N. Y. Mr. Austin's invention relates to improvements in an automatic device for operating hatch-covers for elevators of that class disclosed in a patent issued to H. Mattullath, wherein a latch-bolt is employed for sustaining a hatchway-cover, this bolt being geared to a segment on a short shaft which is equipped with a finger or cam, the latter being disposed in the path of a tappet that is movable with the platform of an elevator car or cage of a suitable type. The construction is practically noiseless in operation.

TENONING-MACHINE.—W. J. MCNAUL, Butte, Mont. The operative means provided in this invention serve to automatically load a log on a carriage embodied in the machine, to clamp the log firmly on the carriage, to preliminarily cut the log, afterward automatically reverse the carriage and the log, subject the log to the final cutting operation in a way to complete the tenons, to reverse the carriage and return the log in a completed condition to the normal position, and finally discharge the log automatically from the carriage.

DUST-COLLECTOR.—L. C. MEYEROTT, Evansville, Ill. This case refers to dust-collectors, the invention being intended as an improvement on devices of this class disclosed in a former patent to Mr. Meyerott. In the present case an object in view is the provision of means for collecting the dust that escapes on the outside of filtering-pockets when they are jarred successively, the outside dust being collected by pneumatic devices which carry the dust back again to the machine.

STOP-MOTION FOR CLOTH-TENTERING MACHINES.—J. L. DABBS, Rockhill, S. C. Much trouble and loss of time and waste of cloth is occasioned by the edges of the cloth becoming detached from the tenter-chain pins of a cloth-tentering machine, and the general object of the invention is to provide automatic means of construction adapted to stop the machine should one or both edges of the cloth become detached from the tenter-chain pins.

MACHINE FOR AERIAL NAVIGATION.—I. I. MORRIS, Mellette, S. D. The purpose of this invention is to provide an apparatus for aerial navigation which will be of simple and durable construction and effective in operation and in which a balloon-supported frame is employed provided with a motive power, including means for lifting, and means for driving, and which also carries a steering device and wheels to support the structure when on the ground.

WEIGHING-SCALE.—J. COLLINS, Sewee, Tenn. The inventor seeks to provide in this case simple and efficient means adapted for operating in a way to ascertain the relative values of commodities which differ in values—such, for example, in using the apparatus by wheat-millers to determine the quantity of flour and bran to be given in exchange for a predetermined or unknown quantity of wheat the grade of which may be up to or below a required standard.

BINDER.—E. M. ANDERSON and G. E. POST, New York, N. Y. This improvement resides particularly in the locking-mechanism. The locking device comprises the usual telescoping parts, the inner of which carries a dog which permits a free telescoping or inward movement, but impinges against the inner wall of the outer tube, so as to prevent outward movement. This dog is controlled by a cam-like member mounted to turn in the inner lock-section and when thrown to a certain position engages the dog and moves it into active position.

BORING AND TENONING MACHINE.—J. WILSON, Lathrop, Mo. The intention in this improvement is to provide a boring and tenoning machine which is simple and durable in construction, very effective in operation, easily applied or removed, and arranged to permit of quickly and accurately boring fellies and other articles and forming tenons on the ends of spokes.

BALL-COCK.—A. NELSON, Quincy, Mass. This mechanism will quickly open and close the water-supply, and by thus avoiding a slow-closing movement the inventor attains a valve which enables the tank to be quickly filled, and which avoids uncertain movements of the float which occur in many ball-cocks. A pipe and shell inclosing the same is provided, these parts being relatively movable and the water supplied to one. Means are provided for imparting the relative movement referred to, and for this relative movement to act as a guard to prevent splashing the water when discharged.

FILLING-TUBE FOR BOTTLE-FILLING MACHINES.—S. C. MILLER, Louisville, Ky. The invention relates to a class of bottle-filling machines embodying a vertically-adjustable tank from which liquid is conducted downward through self-closing tubes into a number of bottles supported below the tank to be filled therefrom. Improvements in this class of apparatus are shown in a former patent of this inventor. The object of this invention is to provide filling-tubes for the bottle-filling machine specified that in suitable number may be employed for the purpose whereby these similar members of the machine are greatly improved in operation.

ATTACHMENT FOR CAN-HEADERS.—R. D. TOWNSEND, Chicago, Ill. The object of this invention is to provide an attachment which may be placed on the machine, thus adapting it to any desired size of can without reorganizing the entire machine. This enables one machine by a very simple adjustment to be adapted to any size of can, and in small factories it will to a great extent reduce the cost of equipping, maintaining, and operating the plant. The invention is applicable, for example. to machines of that class shown in a prior patent to Wheaton, No. 477,584.

ENGRAVING-MACHINE.—I. R. BEAM, Elmira, N. Y. In the present case the invention relates to a machine for engraving from patterns; and it comprises a tracer having connection with a graver, so that by moving the tracer over a pattern or copy the graver will be made to work on the plate to reproduce the subject of the copy or pattern.

Of Interest to Farmers.

POWER DEVICE.—D. LUBIN, New York, N. Y. The present invention relates to improvements in power devices particularly adapted for drawing a cultivator or other agricultural implement through the ground to finely pulverize or break the earth around and between rows of plants or to draw such implement through unplanted ground, an object being to produce a device designed to be operated manually and by means of which a heavy tool may be operated with but little manual exertion and digging deeply into the ground.

DUMPING AND ELEVATING APPARATUS.—P. J. MAUGER, Minier, Ill. Mr. Mauger's invention is an improvement in that class of apparatus employed for discharging or dumping grain or other commodity or material from a wagon or cart into a conveyor or chute, by which it is delivered into a permanent storage-receptacle or into a car, boat, or other medium of transportation.

DITCHING-MACHINE.—P. BERGLUND, Newman Grove, Neb. One feature of this invention is the provision for convenient vertical adjustment of the auger or borer whereby it is adapted for boring ditches of varying depths. Another important feature is the improved construction of the auger or borer itself, whereby it is adapted for both cutting and slicing the earth as the machine advances and also for throwing out the soil thereby loosened.

Pertaining to Vehicles.

TIRE.—C. MILLER, Binghamton, N. Y. The inventor claims as his object the provision of an improved form of protective non-puncturable shoe or casing for cushion and pneumatic tires, and is designed to provide for convenience in securing the opposite edges of the casing to a rim and to insure a strong connection therefor independent of the pressure of the tire proper, especially a pneumatic tire. The improvements are applicable to solid wooden fellies and to metallic rims of different shapes without altering the device.

RESILIENT REST FOR VEHICLE-TOPS.—T. F. GENSMER, Lewiston, Minn. This invention has for its object to provide a novel, simple rest for the support of a reclining vehicle-top and which is adapted to absorb jar incidental to the sudden descent of the top when it is rocked into a reclining position to remove the top from above the seat of the vehicle.

SLEIGH.—JENNIE R. KYLE, Gex, Ky. This is an improvement in that class of sleighs which are formed of runners and hub attachments adapted for use in connection with a buggy or carriage body and its axles. Thus upon removing the wheels of a buggy or carriage from its axle-journals the latter may be inserted and secured in the hubs of the improved sleigh-runners.

Railways and Their Accessories.

INCLINED RAILWAY.—S. E. JACKMAN, Brooklyn, N. Y. The purpose of this invention is to provide an inclined railway arranged to enable persons to enjoy a continuous ride over an inclined or switchback road back to the starting-point, and to allow the proprietor to readily switch the cars in or out from the main continuous track to a siding, to completely control the vehicles during their journey, to avoid accidents, and render the travel of passengers perfectly safe.

CAR.—S. E. JACKMAN, Brooklyn, N. Y. Mr. Jackman's invention relates to amusement devices, such as inclined railways of the kind described in his patent noticed immediately above; and the object is to provide a car arranged for convenient and safe coupling to another car and having a brake mechanism under the control of the attendant to permit of checking the speed of the car on the downslope, the car also having a circuit-closer for closing a circuit in the track to annunciate the position of the car on the track.

RAILWAY-RAIL BRACE OR TIE-BAR.—W. E. ARTHUR, Aberdeen, Md. Mr. Arthur's invention is an improvement in tie-bars or braces for railroad-tracks, by which to tie the opposite rails of the track securely together and brace one from the other. The tie-bar can be made of any desired strength and can be applied to the rails either in new work or in work already constructed and can be arranged at such intervals as may be found necessary to prevent any spreading or other lateral displacement of the rails.

TROLLEY-STAND.—J. J. BOUCHARD and W. F. ENSOR, Bradford, Pa. In the present patent, the inventors seek to produce a construction of the mechanism constituting the bearing around which the pole may swing or turn on a vertical center, the mechanism being so designed as to minimize the friction and wear on the working surfaces, to turn easily and freely without lubrication, and to exclude the entrance of dust and dirt from the working parts. They also seek to produce a construction which provides for the secure attachment of the pole to the pole-socket in a way to relieve the strain on the pole-clamp and to allow the ready interchange of different poles.

AUTOMATIC TRAIN-CONTROLLING MECHANISM.—A. E. OSBORN, New York, N. Y. The purpose of the invention in the present patent is the provision of new and improved means for automatically stopping a car or train of cars independently of the persons in charge and of the signal apparatus of the railway should such apparatus be employed.

CAR-FENDER.—J. A. WILLIAMS and L. B. BRITTON, Seattle, Wash. The improvement of these inventors relates to safety-fenders for cars and vehicles, and has for its principal object the provision of a safety-fender for cars and similar vehicles which is automatic in operation, besides being inexpensive to manufacture, as well as durable, and comprising comparatively few elements or parts which are simple in their embodiment and not liable to get out of order.

RAILWAY-SWITCH.—W. K. SMITH, Denver, Col. In this case the invention has reference to improvements in switches for street-railways, the object aimed at being to provide in connection with a switch-tongue a simple means whereby the switch may be shifted by a motorman on a car while the car is in motion.

SWITCH-OPERATING DEVICE.—W. K. SMITH, Denver, Col. Mr. Smith's invention relates to improvements in devices for shifting switch-tongues for street-railways, the object in view being to provide a simple switching device carried by a car and so arranged that by foot-pressure the motorman may cause the shifting of a switch to either of its positions while the car is in motion.

Miscellaneous.

NON-REFILLABLE BOTTLE.—C. R. SCHUMACHER and D. SPEELMAN, Providence, R. I. In carrying out this improvement the inventors have in contemplation the provision of a bottle which shall be so constructed and arranged that the contents thereof may easily be removed, but at the same time it will be impossible to refill the same bottle again. A further object is to provide a stopper and casing for the bottle-neck which may be easily inserted therein and when in position cannot be removed therefrom without breaking the bottle.

FIREMAN'S HELMET.—C. EAGLE and F. VOGT, JR., New York, N. Y. This invention has reference to improvements in appliances to be worn by firemen in invading rooms or apartments filled with smoke; and the object that the inventors have in view is the provision of an improved helmet designed to minimize the danger of suffocation to the firemen in extinguishing a fire.

FORM OR LAST FOR BOOTS OR SHOES.—J. E. BETE, Stoughton, Mass. The principal object of the invention is to furnish a device which is simple in its embodiment and effective and reliable in use, besides possessing the capacity for long and repeated service. Another object is to provide a device of this character comprising few parts which are easily assembled together and also which is easy to handle, strong, and durable, and not liable to get out of order.

FOLDING TABLE.—W. J. NOBLE, New York, N. Y. The special object in this case is to provide a folding table, the capacity of which when extended will be relatively great, thus overcoming a previous disadvantage that in order to make the table fold compactly its extended size had to be much restricted. In attaining this end, preferably four leaves or top sections are provided. These are each furnished with a folding leg and devices for holding them in extended position. The top sections are hinged, so that when extended they

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present an even table-surface, so that they may be folded flat against each other, placing the table in compact form for stowing away.

COP-TUBE.—E. H. THORNE, Fall River, Mass. The invention refers to improvements in cop-tubes of that class which are used to contain the winding of yarn in weaving machinery, although the tube may be used to advantage in holding the windings of other material. It consists of a paper cop-tube having a frictional holding-surface produced thereon by compressing the tube externally to form a series of conical portions separated by annular shoulders, against which the winding is adapted to lodge in a way to wholly overcome slipping along the tube.

BUCKET.—G. MCELHANY, Watertown, S. D. This bucket is especially designed for use in elevating grain where it is desired to raise grain for filling bins from an upper floor. It becomes desirable in such connection to provide a bucket of large capacity which will be of sufficient strength to sustain the weight and stand hard usage and which will be provided with a dumping-door arranged to be released by a tripping-rope, so that its contents can be discharged by the operator standing at a distance.

METALLIC HORSE-COLLAR.—D. F. O'LOUGHLIN, Moorhead, Minn. In carrying out this improvement the object in view of the inventor is the provision of a horse-collar which shall be neat and durable and at the same time of such perfect fit that scalds, gall, bruises, sores, etc., on the horse's neck and shoulders are obviated.

DISTANCE OR RANGE FINDER.—E. NICHOLSON, Cleveland, Ohio. The aim of this improvement is to provide a range finder, more especially designed for use on marine vessels and the like to readily ascertain the distance the vessel is from a distant object—say a lighthouse—how far the vessel has to sail before it is abreast of the lighthouse, and the distance between the vessel and the lighthouse when abreast, all without requiring any mathematical calculations.

SHELL.—L. G. ROACH, Fredericksburg, Va. The prime feature of the invention lies in the combination of an exploding means and a centrifugally-releasable restraining device for the exploding means. This restraining device is normally active; but when the projectile begins its rotary flight the centrifugal force attending such rotation renders the restraining device inoperative, and then as the shell strikes the target the exploding device is operated by the impact of the blow.

COLLAPSIBLE CABINET OR DARK ROOM.—L. F. WILSON, Gerrardstown, W. Va. Though applicable to other purposes in the arts, Mr. Wilson's improvements are intended more especially for use as a dark room for amateur and professional photographers; and one of the principal objects is to provide a suitable structure of this kind which is collapsible into small compass, for storage or transportation, besides being light in weight and simple in construction.

HEAVY FIELD ARTILLERY.—T. D. SMYTHE, Santiago, Chile. The object in this case is to provide certain new and useful improvements in artillery whereby field-guns of great length, large caliber, and heavy weight can be readily transported from place to place and brought quickly into action with great precision and steadiness and without unduly exposing the gun and gunners to the fire of the enemy or rendering necessary a heavy shield.

NUT-LOCK.—N. D. ASDELL, Lakeview, Ore. The purpose of this invention is to provide means for securely locking a nut to a bolt at any desired point thereon. The improvement consists of novel means, employing a wedge seated in the nut and adapted for engagement with the bolt thread, a key whereby the wedge is forced into locking position, special means for securing the key, and a nut of peculiar construction.

LAMP-HANGER.—D. MCEACHERN, Rossland, Canada. This device may be readily applied over any ordinary ceiling-block by means of the bracket, the hanger-bar being secured to and depending from the bracket and supporting the toothed segment, so the latter can be rotated to bring it to any position, and a fork is so connected with the block of the toothed segment that it may be swung thereon to any adjustment and its locking-block be moved into locking engagement with the segment block and be released by drawing upon the swinging arm, so it can be adjusted to hold the lamp in any position.

HOOK AND EYE.—A. W. HERBERT and W. F. WASHBURN, New York, N. Y. In the present patent the invention relates to hooks and eyes, and the more particular object is the production of an exceedingly flat hook and eye capable of general use, affording a secure grip and admitting of a cheap and simple construction. The hooks and eyes are paired in the usual manner, and each one is made of a thin plate of metal, and preferably by stamping.

SHOE-HEEL.—G. F. FISCHER, Rochester, N. Y. The purpose of the invention is to provide a shoe-heel of the cushion type and means for attaching the heel to the insole of a shoe, and, further, to so mount the thread-section of the heel that it may be shifted to bring to the rear the forward sections, which are comparatively unworn, to take the place of the rear section of the heel, which has become unduly worn, and to vertically adjust such thread-section, so that the latter can be worn throughout the major portion of the depth of the heel.

BOX-PLATE AND ATTACHMENT THEREFOR.—H. MCCANN, Hamilton, Canada. This invention relates to means for shaping and supporting plastic material, such as mortar of cement or hot concrete, in the erection of building or other walls from such material, and the object is to provide novel box-plates and novel means for assembling and holding such plates in box form for the reception of the plastic material and retaining it in proper shape until it becomes rigid.

TWINE-HOLDER.—C. L. PETERSON and M. O. THOMPSON, Sioux Falls, S. D. In the present patent the invention has reference to new and useful improvements in twine-holders, and the object of the inventors is the provision of a twine-holder of simple construction designed to be suspended over a counter or the like and in which the twine will not become snarled or twisted.

CANDLE-HOLDER FOR CHRISTMAS TREES.—P. RUMMELIN, Portland, Ore. In carrying out the present invention Mr. Rummelin has particularly in view the provision of a device which will combine the functions and features of a holder for sustaining the candle in a vertical position when on the tree and a receptacle for containing the grease, wax, or the like dripping from the candle.

DRAWERS.—T. F. TRIMBLE, Valatie, N. Y., and W. A. HARDER, Hudson, N. Y. The present improvement relates to drawers used more particularly as clothing for gentlemen. The garment is comfortable and to a great extent self-adjusting. The seams are so located as to have no tendency to produce chafing or to be otherwise objectionable. The inventors have produced a neat simple article of manufacture having the advantages mentioned above and capable of being cheaply made.

ICE-CREAM FREEZER.—C. E. TAYLOR, Magnolia, Ark. This invention comprises a new combination of parts of a construction capable of freezing the cream in a minimum amount of time and labor, which can be readily repaired by an ordinary tinner, and in which the parts have such correlation that they can be used for either domestic or manufacturer's uses. In addition it can be used for cooking the cream in the holder and as a milk-cooler, etc.

SUSPENSION-SEAT.—H. G. GROTE, 5-7 Doventhorsteinweg, Bremen, Germany. This invention is a suspension-seat, with or without support for the feet, for the use of passengers on the railroad or other means of transportation; for soldiers, even if transported in freight cars; for the transportation of the wounded in war, and in case of accidents or wherever it can add to the comfort of travelers. If used on shipboard, it affords a protection against seasickness.

DESIGN FOR A SMOKE-RING MAKER.—E. NAHR, New Orleans, La. The figure in this design is a full-face view of a smoke-ring maker, with the mouth in formative position for ejecting smoke-rings, the rings floating about the head, the fingers of one hand holding up a smoking cigar and the fingers of the other twisting an end of the mustache.

HARNESS-TRACE.—D. K. BELLIS, Manton, Mich. One object of this invention, which relates to improvements in harness-traces of that class which employ leather and metallic chains in their construction, is to overcome stretching of the leather by a composite trace embodying a metallic chain as an integral part thereof, the leather and the chain being so combined as to retain the desirable pliability or flexibility of the trace.

ENVELOP-SEALER.—W. MCD. HENRY, Kesley, Iowa. Mr. Henry's invention refers to improvements in sealing devices for envelops, particularly envelops for expressing money or other valuables, the object in view being to provide a simple device for this purpose that may be quickly sealed and the use of wax and tape or ribbon be dispensed with.

GAME APPARATUS.—D. MCRUER, Pauls Valley, Ind. Ter. Among other things this invention has for its object to provide means for automatically rotating a central object or turret, to provide an improved group of emblematical figures in the central rotary object or turret, to employ a movable or shiftable impelling device and to provide means which enable the impelling device to be advanced in case a light shot is to be discharged. The invention is an improvement on a prior patent of Mr. McRuer.

PULLEY-FASTENING.—A. W. HIGHT, Ballard, Wash. The purpose in this case is to provide means for preventing the slipping of split pulleys on their shafts. The invention is especially applicable to that class of pulleys in which the sections are held up by U-bolts or clevises passing through the pulley-sections and encircling the shaft. The invention involves certain improvements in the key for engaging the U-bolt with the shaft.

NON-REFILLABLE BOTTLE.—W. E. JOHNSON, Spokane, Wash. It is the object of this contrivance to effect an improvement in that class of non-refillable bottles which are provided with a stopper or plug having a valve adapted to open for discharge of contents of bottle when the latter is held in the required position. The stopper with its attachments may be returned to the maker or jobber for reuse.

ADVERTISING DEVICE.—L. R. GAYNOR, Coon Rapids, Iowa. The purpose in this case is to display an advertisement at a desired point by its flexible connection with a movable door and attract attention by joining the placard on which the advertisement is placed with a grotesque figure that will be fully exposed, along with the advertisement, when the door is moved in the act of opening it, the closing permitting a return movement of the advertisement and a merging of the grotesque figure into an unrecognizable form.

FILTER.—J. P. RUMMEL, Sioux Falls, S. D. One of the principal objects of this inventor is to provide a filter which shall separate and purify the water passing through the same of all animal matter, sediment, or the like. A further object is to construct a filter which may be easily and quickly attached to a faucet, hydrant, or spout, or the like, and which shall perform its proper function without requiring further attention.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 4603.—For machinery for making knitted goods.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 4604.—For a machine for sharpening toilet clipper blades.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 4605.—For direct-current dynamos for supplying about 50 incandescent lamps.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 4606.—For a machine for perforating hard-drawn copper 31 B.W. with round holes. Also for dealers in such copper.

Mechanics' Tools and materials. Net price catalogue. Geo. S. Comstock, Mechanicsburg, Pa.

Inquiry No. 4607.—For makers of pianos, furniture and carriages, having export trade.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 4608.—For machines for shrinking and measuring cloth.

Metal Stamping Co., Niagara Falls, N. Y., cuts and forms sheet, bar, rod, or wire any shape.

Inquiry No. 4609.—For a quick-speed tool steel alloy containing tungsten, molybdenum and chromium.

Novelty makers should write sending lists to Howie & Co., general importers, Auckland, New Zealand.

Inquiry No. 4610. For a pencil-making machine worked by a 1 or 2 h. p. engine.

Let me sell your patent. I have buyers waiting. Charles A. Scott, Granite Building, Rochester, N. Y.

Inquiry No. 4611.—Wanted, an oil burner suitable for use under a small, horizontal boiler for steam-heating purposes.

Gear Cutting of every description accurately done. The Garvin Machine Co., 149 Varick, cor. Spring Sts., N. Y.

Inquiry No. 4612.—For the present address of the Massey Harris Co., Ltd., of Canada.

Party desires to purchase either entire or half interest in small manufacturing plant. Must be desirable. Geo. F. Russel, 2944 Vernon Ave., Chicago, Ill.

Inquiry No. 4613.—For makers of electric automatic registers to register the number of times the circuit of an electric battery is closed.

We manufacture anything in metal. Patented articles, metal stamping, dies, screw mach. work, etc., Metal Novelty Works, 43 Canal Street, Chicago.

Inquiry No. 4614.—For a shooting gallery outfit.

The largest manufacturer in the world of merry-go-rounds, shooting galleries and hand organs. For prices and terms write to C. W. Parker, Abilene, Kan.

Inquiry No. 4615.—For machines for spinning piano bass strings, also moulding machines for piano frames and general small work.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 4616.—For makers of tubular smoke stacks.

Contract manufacturers of hardware specialties, machinery, stampings, dies, tools, etc. Excellent marketing connections. Edmonds-Metzel Mfg. Co., Chicago.

Inquiry No. 4617.—For makers of telephone systems.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery and tools. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 4618.—For dealers in platinum wire or sparking points for gas engines.

WANTED.—New novelties that are ready for the market. Must possess merit to justify extensive advertising in this and Foreign Countries. *What have you?* Wizard Novelty Co., Inc., 1007 Filbert Street, Philadelphia.

Inquiry No. 4619.—For parties to finish and make small, light castings.

A large casualty company desires to obtain the services of three or four high-class men with good experience to inspect boilers and elevators. Please reply stating age, weight, qualifications and references. Address Inspector, Box 773, New York.

Inquiry No. 4620.—For makers of tack machines.

WANTED.—A number of good instrument and tool makers at Edison Laboratory, Orange, N. J. Wages $3.25. Call or address Thomas A. Edison, Orange, N. J.

Inquiry No. 4621.—For makers of different novelties.

Young man studying mechanical engineering desires position with reputable house. Experience more of an object than salary. H. A. Klein, 1250 Degraw Street, Brooklyn.

Inquiry No. 4622.—For plans and specifications for a fifty-foot pleasure launch.

WANTED.—A solution to impregnate and harden articles made of paper.

Douglas Mfg. Company, Fall River, Mass.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(9179) E. C. H. says: We desire to install a pumping engine to raise 150,000 gallons of water in a run of 24 hours. Our boiler pressure is 110 pounds, discharge pressure 80 pounds, in case of a fire we would want to raise it to 100 pounds. Suction 15 to 20 feet. Supply of water to pump is ample. We have studied slide valves, balanced valves, semi-rotative valves, etc., and find it hard to decide which is most suitable. Will you please inform us as to the proper proportions, cylinders, stroke, etc., for a compound engine to meet our needs; also which style steam valve is the most economical? A. Without knowing all of the details of the character of the pump which you are designing, it is impossible for us to give you any information in regard to proportion of the cylinders, stroke, and valves needed for a pump to do the work which you describe. The valve which is most generally used and which gives the best satisfaction for cold water pumping, is a hard rubber disk held by means of a spiral spring on a bronze seat. Where the quantity of water to be pumped is large, a number of these valves are arranged close together. The same type of valve is usually used for the inlet as for the discharge. Much practical experience is necessary in order to build a satisfactory and efficient pump. We would advise you to write to some of the well-known pump manufacturers, and ask them if one of their regular pumps will not meet your requirements. If not, they can doubtless build you a special pump that will.

(9180) J. J. G. asks: Please answer through your paper which is the most elastic, such as glass and ivory or india rubber, and why and oblige. A. Glass, steel, and ivory are the most elastic substances known, if by "most elastic" is meant the ability to restore their form after distortion and the retaining of that power for an indefinite time. India rubber has far less elasticity of this sort. It quickly gives out and will not come completely back after distortion. India rubber has a great range of elasticity and can be bent or stretched much farther than most other substances. In range it is far more elastic than glass, steel, or ivory.

(9181) W. J. H. says: Can you tell me whether practical use is being made of gravity motors at the present time? Would it be feasible to construct a motor of this kind to generate about one-fourth of a horse power for a period of ten hours, using a steam engine or wind mill for winding the heavy weight up and then utilizing the gravity motor for power at such times when the engine or windmill was idle? What would be the best plan for the construction of such a motor? A. We know of no gravity motor on the market which would furnish a fourth of a horse power for ten hours. A clock with weights is a gravity motor, and anything which requires more power than could be run by well-constructed clock work could not be satisfactorily run in this way. A motor to furnish a fourth of a horse power for ten hours would require a weight of 33 tons lifted to a height of 150 feet, provided the efficiency of such a gravity motor were 50 per cent.

(9182) F. B. D. says: Please inform me which are the warmest, for the sides of a house, shingles or clapboards? A. If shingles are laid on building paper, or on any surface which is practically air-tight, they will probably keep a house warmer than clapboards. If, on the other hand, the shingles are laid directly on the sheathing, which usually contains a large number of cracks and openings which would admit air, the shingles will probably not keep the house so warm as the clapboards, because they will admit more air into the walls from the outside.

(9183) R. W. G. says: I am sincerely interested in knowing the shape and motions of the earth. Please answer the following questions in Notes and Queries: 1. Have any surveys ever been made to determine whether the known curvature of the earth's surface is convex or concave? A. All surveys of any extended portion of the surface of the earth demonstrate that the surface of the earth is convex. No line a mile long run for a canal in which water is to flow can be run without taking into the measurement the convexity of the earth, which is almost exactly 8 inches in one mile. For two miles it is very nearly 32

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inches. See any book upon leveling or geodetic surveying for the mathematics of this. The fact that the surface of still water is a convex surface shows that the surface of the earth is convex, since water covers about three-quarters of the earth's surface. It is said that an Englishman a few years ago wagered that no one could prove that the surface of the earth was convex, and put the money in the hands of the editor of a sporting paper. A surveyor took up the wager and set stakes of the same height in a lake a mile apart, and proved that the middle of three stakes was eight inches above the two on either side of it. The editor decided that this was proof and paid over the money. 2. If so, who made the survey, and when? A. Every survey which runs a level for any number of miles demonstrates the convexity of the earth's surface. The survey to establish the length of the meter in France about 1780 is such a survey. All the work of the United States Coast and Geodetic Survey is such work. The laying out of the great irrigation canals in the West and the surveying of public lands of the United States are also examples. The pendulum method is also complete as a demonstration of the shape of the earth. 3. Are there any demonstrable proofs of the earth's rotation upon its axis? A. The terrestrial proofs of the earth's rotation upon its axis are equally conclusive. The principal ones are the eastward deviation of bodies dropped from a great height, the Foucault experiment with a long pendulum, and the gyroscope. Besides these may be mentioned the deviation of projectiles to the height in the northern hemisphere, the trade winds, and the rotation of cyclones. All these are discussed at considerable length in the work of Young referred to above. If our correspondent is not convinced by these demonstrations he would hardly be convinced "though one rose from the dead." 4. Are there any demonstrable proofs that the earth moves around the sun? All the proofs given in Young's, Newcomb's, or Proctor's works are astronomical that must depend for their truth on something that is assumed, and as a proof founded on an assumption is no proof until the assumption is proven, I want a demonstrable proof that is not founded on an assumption, if there be such an one. A. From the nature of the case, there can be no terrestrial proofs of the earth's revolution around the sun. This is an astronomical fact. The aberration of light and the parallax of the stars are explicable only by the earth's revolution around the sun. These have satisfied astronomers for nearly a century and will still be deemed satisfactory. They may be "founded on an assumption," but an assumption is entirely legitimate, and proof for the assumption will establish its truth as certainly as proof of fact from which a law may be deduced, will establish that law.

(9184) S. R. says: Referring to your note No. 9036, A. W., June 6, and note No. 9086, A. M. W., July 11, regarding the coloration of glass as observed at high altitudes, and your request that some reader might throw some light on the subject, I have to say that at this place, which is an old mining camp, situated at an elevation above tide of 5,200 feet, it would be an impossibility anywhere in the neighborhood to find a piece of what was originally *white* glass that is not now of a violet tint, ranging according to length of exposure from a light amethystine tint to a very deep purple, excepting only such fragments as have recently been thrown out. In your answer to 9036 you say, "We should look for the cause of the discoloration" [it is rather a *coloration*. S. R.] "of the glass to some substance in the region rather than the altitude." In this you are no doubt correct. I have submitted some samples of the glass to a Washington scientist, with the suggestion that as radium has the property of coloring glass a purple or violet tint, there might be a pitchblende or uranium in this section. He thought, however, that the coloration was due to something used in the manufacture of the cheaper kinds of glass, such as a mineral of some kind. As the subject appears to have excited some interest, I take the liberty of sending you by mail a small box of fragments of glass, showing the various purple tints to which the glass has been colored by exposure. I might state further that there is but little soil, so little that there is only a very sparse grass to be seen after heavy rains, which quickly dies out. It is all rock, rock, rock, principally porphyry. There are found here gold, silver, copper, zinc, and I believe also bismuth, with some other minerals. Bismuth is, I believe, possessed of some properties similar to uranium. I do not know that I have thrown any light on the subject, but I hope others may, as it has excited much curiosity here.

(9185) A. C. J. says: In SUPPLEMENT No. 1440, of August 8, 1903, in the article "The Size of Atoms," at the end is mentioned Prof. Osborne Reynolds' Rede lecture on a new theory of gravity. Will you please tell where this lecture may be found published? A. The matter in question was quoted from the Engineer, London, to which we shall be obliged to refer our correspondent for information regarding Prof. Reynolds' Rede lecture, on a new theory of gravity.

(9186) P. E. J. asks: When the elements cæsium and rubidium are placed in water they decompose it with the liberation of H. which takes fire, but does Cs give the flame a blue color, or Rb a red? In nearly all books on chemistry I find that the element erbium has never been isolated. On looking through Merck's Index, 1896, a catalogue of nearly every chemical known, I find it thus: "Erbium (E) metal, dark gray powder." Also tell me if this element is not like didymium, which has been split into different elements? A. Cæsium was named from the blue lines which its flame gives in the spectrum, of which there are two. The word cæsium means sky blue. Rubidium in a similar way gives two dark red lines. The word rubidium means dark red. Both are from the Latin. With reference to erbium, Remsen's "College Chemistry" says: "A final statement cannot be made as yet. It is even questionable whether it is an element."

(9187) L. F. B., Jr., says: Would you kindly tell me where I can get data and formulas for small plunger pumps for circulating water in small quantities? What is the allowance of efficiency, and what is good practice for relation of stroke to bore? A. A good practice does not allow the speed of a plunger pump to exceed 100 feet per minute. For very small pumps the speed should be considerably less than this if smooth action is desired. The relation between the stroke and the bore of the pump is immaterial, provided the displacement of the plunger per stroke is kept constant. Ordinarily the stroke is determined by the requirements given above regarding the speed, or the diameter is determined by the pressure requirements. For a steam pump the diameter of the steam cylinder and the steam pressure control this. The efficiency of a small plunger pump is seldom over 50 per cent, and in case of a very small pump would be considerably under this figure. Without knowing the exact size and character of the pump, it is impossible for us to give you more exact information on this point.

(9188) H. H. says: Can you furnish me with formulas for both the solution and the wax used by electrotypers? A. Gutta percha, or impermeable plaster, or one of the following mixtures may be used for the purpose: White wax, 200 grammes; spermaceti, 30 grammes; stearine, 250 grammes; plumbic carbonate, 30 grammes.

(9189) B. W. R. says: I want to call your attention to a little matter here with wheels and irrigation canals. We have a canal 16 feet wide with a fall of two feet to the mile. We run 7,000 miner's inches of water therein, which makes it about four feet deep. We have undershot wheel in the ditch. Any one of these wheels, 16 feet long and 16 feet in diameter, is raising 25 inches, 250 gallons per minute, 25 feet high. In one place in the ditch we have four of these wheels working close together, that is, just barely working clear of each other. There is no difference between the speed and power of either of these four. The water in the ditch is not raised, that is, not booked up above the first wheel. Now, then, if we were to put 16-foot wheels all the way along the ditch, and each one of them were to do as well as either one of the four mentioned, and let them all raise water from a side ditch so as not to diminish the quantity of water in the power ditch, we should have power enough to raise many times the water in this ditch. I know something about what theory claims will be done with these wheels, and yet we all know what they are really doing. How am I to account for the discrepancy? Figure this out before laying it aside. We could put 300 of these wheels in the mile ditch. They would raise 7500 gallons of water 25 feet high, which would be 90,000 gallons 2 feet high (or the fall of the ditch in the mile). This would be accomplished in one minute, while it would take fifteen minutes for the same quantity of water to pass through the ditch. In other words, the ditch at the side which carries the water to be raised would have to be many times larger than the power canal. I am telling you what is actually taking place here every day in the irrigation season and is not attracting much attention. No matter what our books may say about power generated by water in streams, there is a matter here worthy of discussion and observation. A. The explanation of the apparent paradox which you give in your recent inquiry is very simple; you have undershot wheels 16 feet long and 16 feet in diameter, raising 250 gallons 25 feet high per minute. Four of these wheels do not, apparently, affect the level of the water in the ditch in which they are running. These wheels get their power from the water because of its velocity as it flows to the ditch. This velocity is gradually acquired as it falls, and after the water has reached a given velocity, you may place in your ditch enough wheels to absorb the power equivalent to the energy of the water due to this velocity. If you add more wheels than this, you will get no additional power, but will simply reduce the velocity of the water in the ditch. If you were to put in 300 wheels, as you suggest, the velocity of each wheel would be so much less than the velocity of your present wheels that you would not be able to generate anything like as much power per wheel as you are doing now, and the sum of all the power generated from the entire 300 wheels would not exceed the energy in your stream.

(9190) E. O. L. says: Can you inform me what kind of a preparation to use to cover iron work, nail heads, and bolts to keep the rust from coming through the white paint? I want something to use in boat work around salt water. A. If you were to cover your iron work, nail heads, bolts, etc., with the black asphaltum varnish that is ordinarily used for iron work aboard ship, and cover this with white lead paint, we believe that you would have less trouble from the rust coming through. Rust will not so readily penetrate a paint which contains varnish as it will the ordinary lead in linseed oil paint. There is, however, nothing that we know of that will absolutely prevent the trouble you speak of.

NEW BOOKS, ETC.

GERMINATION DE L'ASCOSPORE DE LA TRUFFE. Par M. Emile Boulanger, Pharmacien Licensié ès Sciences. Rennes-Paris: Imprimerie Oberthur. 1903.

RADIUM AND OTHER RADIO-ACTIVE SUBSTANCES. Polonium, Actinium, and Thorium, with a Consideration of Phosphorescent and Fluorescent Substances, the Properties and Applications of Selenium and the Treatment of Disease by the Ultraviolet Light. By Wm. J. Hammer. New York: D. Van Nostrand Company. 1903.

Readers of the SCIENTIFIC AMERICAN SUPPLEMENT will doubtless recall the admirable series of papers by Mr. William J. Hammer, on the radio-active substance, and on selenium and the Finssen light. In this comprehensive paper Mr. Hammer presented all that is now positively known of radium, the practical utilization which has thus far been made of selenium, especially by Ruhmer, and the remarkable results obtained by Finssen of Copenhagen, with the ultraviolet rays in the cure of skin diseases. Mr. Hammer's book is noteworthy for its compactness as well as for its comprehensiveness.

THE FIGHTING CHANCE. By Gertrude Lynch. New York: Smart Set Publishing Company. 1903. 12mo. Price $1.25.

Just to prove that prefaces are sometimes read not only by the public to whom they are addressed, but even by book-reviewers, let it be said here that Miss Lynch's preface is an admirably studied bit of irony that cleverly hits the average reader in his most vulnerable spot—his careful disregard of the introductions to the books he reads. Miss Lynch's novel itself tells in a sparkling, epigrammatic style the story of a house party composed of men and women, all bent upon attaining a certain object. Starting with the catch-phrase that each one has a fighting chance in reaching the goal, the book tells how that fighting-chance is utilized. In the end a clever *ingenue*, after having succeeded in accomplishing the very task which she had set for herself, is undermined by her own cleverness, and does what every woman eventually does—falls in love with the man who is least able to gratify her ambitions.

The Warner Library of the World's Best Literature is at last within easy reach of every American home. This enterprise was effected by the "Public Opinion Club." The first edition, published a few years ago, was offered only at subscription rates, and at a high price. The New Memorial Edition contains many beautiful illustrations in color, a course of systematic reading, and other new features have been added. The present Warner Library is an improvement in every respect over the earliest. It is a splendid array of *de luxe* books, taking note of every author and every worthy literary production from the earliest days of writing up to the present time. Nowhere else can a complete survey of the world's literary thought be obtained. It is impossible in a brief notice to indicate the remarkable scope of the Warner Library. But, if the inquiry coupon given with the advertisement in a previous issue is sent in, it will bring handsome specimen pages and full particulars.

SUBJECT LIST OF WORKS ON ARCHITECTURE AND BUILDING IN THE LIBRARY OF THE PATENT OFFICE. London: The Patent Office. 1903. 18mo. Pp. 164. Price 25 cents.

The twelfth in the Patent Office Library Series—a comprehensive little series which we had occasion to commend on other occasions.

ELECTRICAL INFLUENCE MACHINES. By J. Gray, B.Sc. New York: D. Van Nostrand Company. 1903. 16mo. Pp. 296. Price $2.00.

Prof. Gray's book deals with the historical development and modern forms of influence machines and also gives instructions for making them. The illustrations are excellent, and there is almost a total absence of familiar friends. In the whole electrical field there is no more interesting branch for experiment, and this book, which we can commend, can be profitably used as a basis.

THE VULGARIANS. By Edgar Fawcett. New York: Smart Set Publishing Company. 1903. 12mo. Price $1.

Mr. Fawcett has succeeded admirably in missing the best chance in the world of giving us a piece of biting satire. He has told with colorless, photographic accuracy the stupid adventures of three very foolish young people, left with fabulous wealth by their father, and imbued with the desire to shine in the world of society. The characters are of the type with which Americans in the East are all too familiar—Westerners, whose ignorance of the ways of the world in which they would like to live is exceeded only by their intense ambition. The situations suggested would have lent themselves admirably to satirical treatment. Yet Mr. Fawcett has contented himself with telling his story in a matter-of-fact way, that smacks more of some dull English weekly than of the "Smart Set."

A PRACTICAL TREATISE OF THE STEEL SQUARE AND ITS APPLICATION IN EVERY DAY USE. By Fred T. Hodgson. 2 vols. Chicago: T. J. Drake & Co. 1903. 16mo. Pp. 242, 230. Price $2.00.

Mr. Hodgson's remarkable work is the outcome of papers written in 1872 on "The Use of the Carpenter's Steel Square." These were among the first that were ever issued devoted entirely to describing the uses and applications of the square, and so well did they meet with the appreciation of workmen who were interested in the steel square, that the author was urged to put the papers in book form and several hundred thousand copies have been sold, indeed it is doubtful if any other technical book ever had the same sale. Now nearly everything that is known about the steel square is embodied in the two handsome volumes. The most intricate problems are solved with the aid of the steel square. It is not too much to say that a carpenter who does not possess these volumes has one of the most valuable tools left out of his kit.

THE NEW INTERNATIONAL ENCYCLOPEDIA. Edited by Profs. Gilman, Peck, and Colby. New York: Dodd, Mead & Co. 1903. Vols. VIII. and IX. 4to. Pp. 955, 953. Published by subscription.

It is very gratifying to note that in this excellent compendium the treatment as well as the authorship is almost purely American, which is rather essential in a work of this kind, which is intended for American readers. The condensation of subjects is admirable, and typographically it is excellent. The maps and plates are excellent and the illustrations are numerous. Many subjects are treated for which we have looked in vain in other works of a similar nature. The inclusion of biographies of living persons is most helpful. The farmer will find authoritative articles on agriculture, and will learn of the interesting experiments that have been conducted during recent years by the Department of Agriculture, and every profession and walk of life is similarly treated. The two volumes before us reach down the alphabet as far as "Infant Phenomenon," which is interesting, showing the remarkable scope of this encyclopedia, for it is unusual to include characters from works of fiction in a work of this kind. It will be remembered that the "Infant Phenomenon" was Ninetta Crummles, a character in Dickens's "Nicholas Nickleby."

KALEIDOSCOPE. Vol. XI. Published by the Students of Hampden-Sidney College, Va. 4to. Pp. 170. Price $2.00.

A very well-gotten-up college annual. An appreciative notice of ex-Judge Roger A. Pryor, LL.D., is included.

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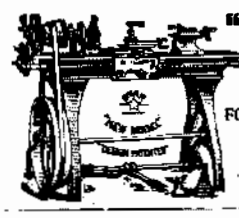

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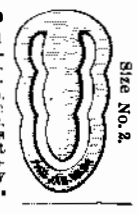

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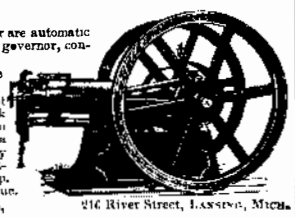

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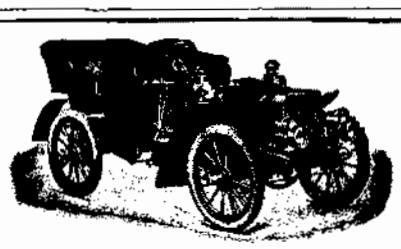

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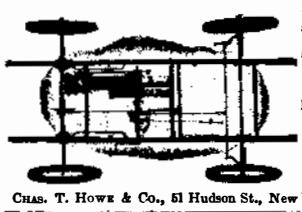

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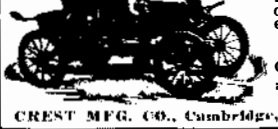

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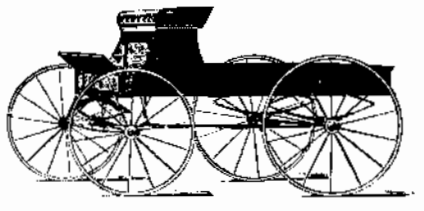

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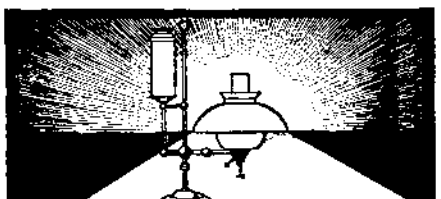

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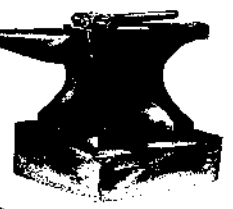

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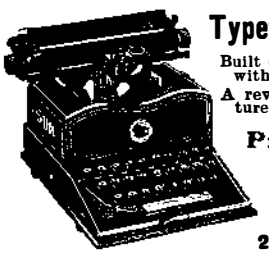

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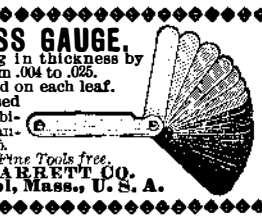

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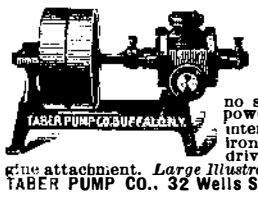

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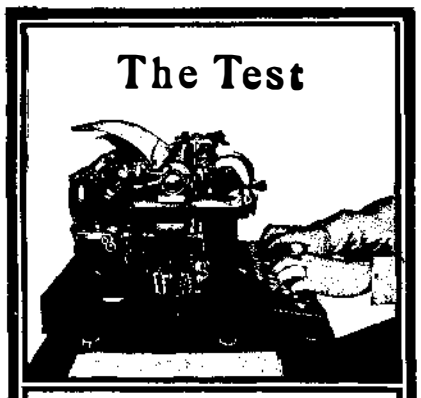

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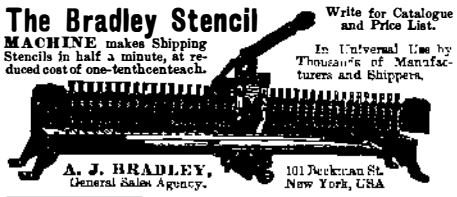

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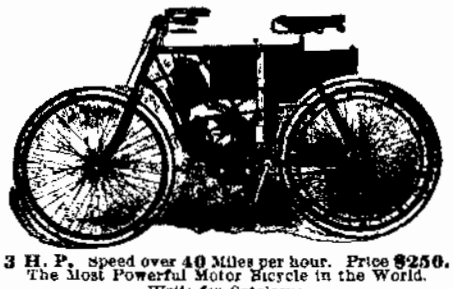

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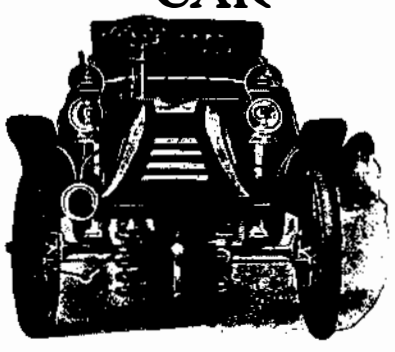

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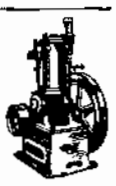

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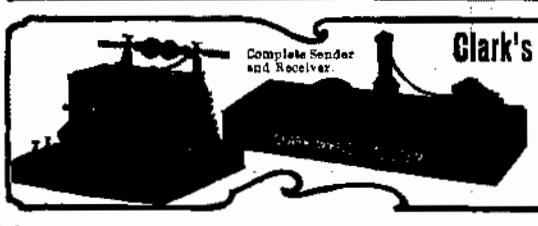

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